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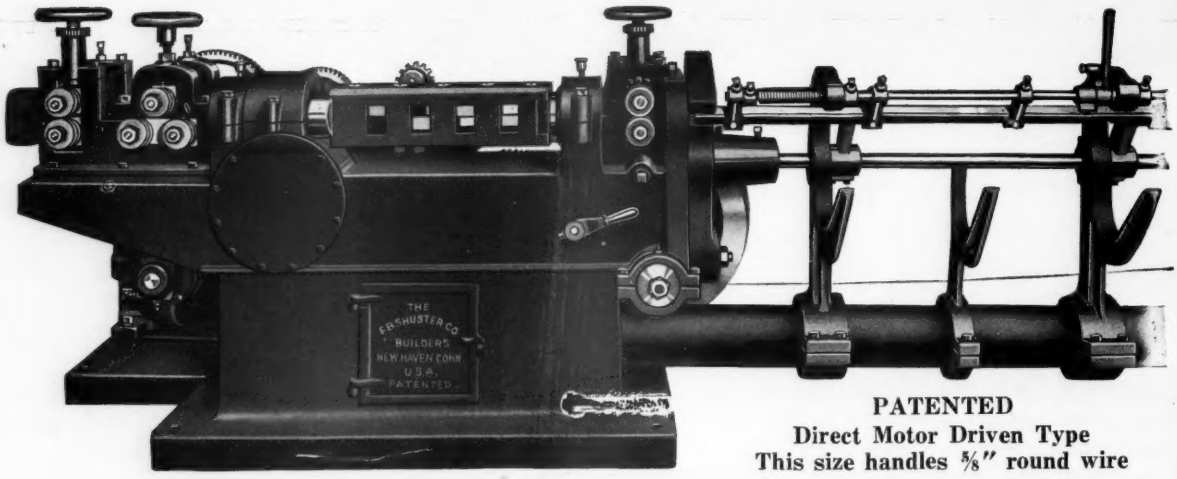

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This size handles ⅝" round wire

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EVERY once in awhile some inquirer asks if we can refer him to an association that might be considered headquarters for the common interests of wire manufacturers. The latest inquiry of the kind comes from an important Government department, and to it, as to all others, we are obliged to answer no, but so far as is in our power we try to provide a common meeting ground for representatives of the industry, a clearing house for information pertaining to it, and an authoritative source of supply for news of its activities.

There are limitations, however, to the extent of the work of this character that can be undertaken by the publishers of an industrial journal. When it comes to collecting, analyzing and disseminating the quantities and kinds of data now required by trade associations, no private agency can substitute for an organization made up of actively interested business men united in a common cause.

We are not to be understood as advocating plans that may now or later be engaging the attention of any particular individuals or groups, but we may be counted on to lend any assistance in our power to leaders whose minds may be running in this channel.

We know most of the agencies for initiating such cooperative industrial efforts, are familiar with parallel situations in other industries, and are in a position to sound out the sentiments of progressive executives in the field. It is to our advantage that we can stand aloof from commercial rivalries that might hamper the best-intentioned efforts of individual manufacturers.

For the present, therefore, let it suffice for us to go on record with this assurance that the facilities of Wire & Wire Products are at the disposal of any constructive movement for advancing the best interests of the trade it represents.

The Publishers

WIRE & WIRE PRODUCTS

A monthly publication devoted to wire drawing and wire forming

Vol. 3 **September, 1928** **No. 9**

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The fact remains that the European competitor is able to undersell the American Wire Manufacturer, in spite of heavy duty and transportation charges.

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6. Die room cost is cut 75% and more.
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WIRE
& WIRE PRODUCTS

Vol. 3 SEPTEMBER, 1928 No. 9

Wire Testing By Mechanically Operated Machinery

Heavy duty equipment for large scale testing checks defects by torsion, bending, twisting and alternate stress.

By J. D. Brunton

Brunton's Research Laboratory, Musselburgh, Scotland

Two preceeding articles by Mr. Brunton have dealt with the commonly used varieties of testing machines for determining the tensile strength of steel wire. Methods and apparatus for testing ultimate stress, yield point, elastic limit and torsional resistance were described as in current use for laboratory and ordinary shop practice. The accompanying article has to do with mechanically operated devices and will be followed by articles in subsequent issues on magnetic and chemical testing.

A mechanically operated torsion machine is used by large works where a great number of tests have to be done. With a machine of this type one operator can look after three machines at once. The machine torsions wire at both ends at one time and the operation is so controlled that, when the wire breaks, the machine is immediately stopped.

Fig. A shows such a machine and is capable of torsioning wires of any diameter from 14 S. W. G. to 6/0 S. W. G. The machine consists of two rotating vises, each mounted in a head, one fixed and the other sliding. Both these vises are rotated by one shaft at the same speed. The fixed head is rotated in the opposite direction to that of the sliding head by means of a fourth spur wheel of the same number of teeth as the driving spur wheel. The driving spur wheel of the sliding head can move along the driving shaft, which is castellated. The machine is operated by two levers —the longer and left hand lever is used to bring the sliding head into the position required by the test. The wire to be torsioned has a right angled bend at each end with the required length of wire between these points. The wire is dropped into slots in the screw vices and tightened. The right hand lever operates a clutch on the driving shaft, and the moment that motion is transmitted to the wire, the left hand lever is automatically released and a slight tension is put on to it by means of a spring at the rear end of the sliding head. This slight tension effect serves to keep the clutch in operation. The moment the wire breaks this tension is released and the clutch is automatically thrown out. Attached to the fixed head is an automatic counter which records up to 200 torsions.

Alternating Torsion Test

Another form of torsion test which promises to be in demand in preference to the usual form described above, and which tends to magnify difference in tests taken over a length of wire from the same coil, is the Alternating Torsion Test.

The mode of procedure is to apply a cycle of torsion to a specimen of 100 diameters length by rotating the handwheel through one positive revolution, then two negative revolutions followed by two positive revolutions and so on.

Unless the wire is hopelessly brittle it will show before fracture four distinct stages during failure. The first stage picks

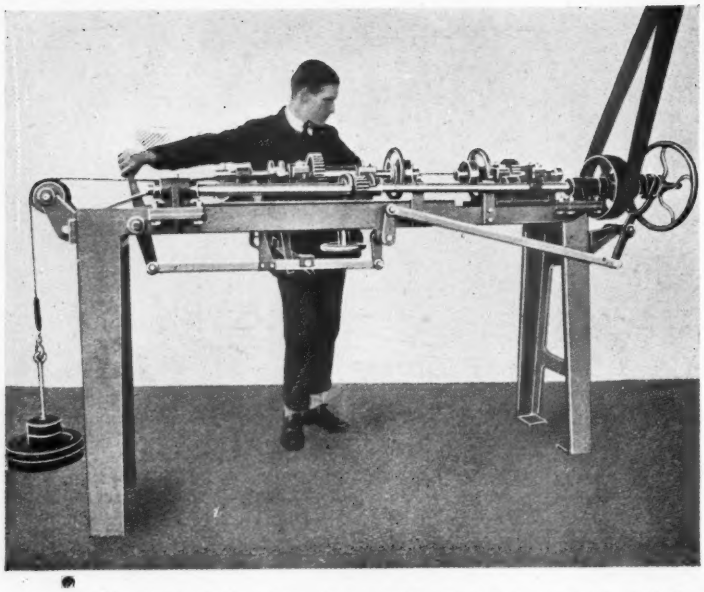

Fig. A.—A machine for torsioning wires. Two rotating vises, each mounted in a head, one fixed and the other sliding, are rotated by one shaft at the same speed. Attached to the fixed head is an automatic counter which records up to 200 torsions.

out the weakest spot in the length and its end occurs when plastic stress is localised. This is seen by watching the specimen carefully. The next stage is the first distinct splitting of the wire. In some wires this is clear and sudden and the test piece opens distinctly along a diametral plane. In other cases it is difficult to detect as the observer can hardly tell whether the crack is superficial or not. The third stage is the breakdown. This, in general, is very distinct and is marked by a slight noise of fracture. The specimen, however, does not part and the test is continued until parting occurs. This is the fourth and last stage.

Types of Fracture

The appearance of the fracture is characteristic of the material and the amount of wire drawing. While in the ordinary torsion of rope wire the fracture is usually right, i. e., in a plane at right angles to the axis, and so does not teach us much, with alternating torsion it varies from a right fracture with a diametral split through all stages of longitudinal splitting to extremely fibrous forms (see Fig. B). No. 1 shows the right angled fracture of a rope wire which has been softened by galvanizing. No. 2 shows a long flat fracture which may be described as lance-like or spear-headed. In No. 3 the fracture is shorter and shows just an indication of being fibrous. Such fractures are usually helicoidal. In No. 4 the breakdown has occurred, but parting is not complete. The fracture is helicoidal fibrous. In No. 5 the fibres are long and outstanding. This might be called stranded. In No. 6 the fibres are very fine and the specimen is not unlike a brush. Such a fracture might be termed hairy.

From the accompanying table of average values in alternating torsion compared with the breaking loads it will be seen that there is a wide range of localisation values. As a rule, the smaller values indicate the higher and the greater values the lower tensile wire. The figures for the first splitting or cracking are uncertain in some grades of material. The breakdown figures are measures of durability but comparisons are best among wires of the same diameter. Parting may follow immediately upon breakdown or it may occur long afterwards. The differences mark different types of wire. In the latter case the higher figure for parting is due to the wire having a longer fibre.

Bending Test

The bending of wire round a given radius is now becoming a more general test than the torsional test for patented steel wire, such as rope making wire, because in actual practice the stresses that are set up in a wire rope are really never torsional in character. In going over pulleys or round swifts the wires in a wire rope are subjected to a slight bending stress, hence the necessity for a bending test in a specification for roping wire.

The bending of wire is done in a special machine, as illustrated, or may be done in a vise. The illustration of the bending machine shown is where the "jaws" are made with the required radius.

The wire is slotted through the correctly sized hole in the small arm which projects from the bending lever and is then gripped in the screw vice underneath. The jaws of this vise are rounded to the required radius.

Diameter of Wire.	Breaking Load Lb.	Break. Stress Tons sq. in.	Torsions 100 d.	Localisation	Split	Breakdown.	Parting
0.078	1066.3	99.64	37.5	20.5	32.0	39.0	50.9
0.080	975.0	86.6	35.8	30.0	56.2	61.0	68.5
0.080	1240.0	110.1	38.4	39.2	55.2	62.6	65.8
0.089	1570.0	112.7	39.7	11.8	34.2	58.2	84.0
0.090	1470.0	103.2	36.5	26.4	38.0	63.1	83.3
0.090	1210.0	84.9	37.8	25.7	42.8	61.7	69.8
0.100	1650.0	93.8	40.5	19.4	43.8	57.2	71.0
0.103	1933.0	103.6	33.3	25.0	31.7	37.0	52.7
0.106	2263.0	114.5	38.0	8.2	18.4	22.8	34.6
0.109	2127.0	101.8	28.3	20.5	27.7	34.5	40.5
0.112	1850.0	83.8	38.3	43.5	82.8	92.2	97.4
0.112	2375.0	107.6	30.3	12.8	24.0	33.8	40.0
0.125	2470.0	89.9	11.0	44.8	57.7	58.0	60.5
0.127	2863.0	100.9	32.9	15.8	47.6	71.2	112.3
0.128	3370.0	116.9	33.3	22.3	34.3	35.3	40.3

A table of average values in alternating torsion compared with breaking loads showing the wide range of localisation values. It will be seen that parting may follow immediately upon breakdown or it may occur long afterward.

There is another bending machine in which the jaws are detachable. The bending is done in the horizontal plane and the wire is fixed in two vices. The jaws are fixed to the bending arm and are situated practically at its centre so that in reality they rotate round the wire. The usual method in this type of machine is to count the number of 180° bends the wire will stand before fracture, the first bend through 90° not to be counted.

It has been found that a larger number of bends can be got from a piece of wire if a slight strain is put on the wire during the bending operation. The increase in bends is, however, not attributable to a slight tension but is due to the fact that in most bending machines there is a fixed bending moment. In bending the wire, if the length of the bending arm exceeds a certain amount, the natural flexibility of the wire will be called into play and in the first 45° of the bend the wire will not lie entirely round the radius with the result that, as 90° is approached, the wire will bend with a curvature whose radius is considerably less than the radius of the bending machine. Therefore, if a slight tension is put upon the wire, it ensures that during bending the wire will lie evenly round the radius.

Wrapping Test

In this test the wire must stand wrapping 8 times round its own diameter and unwrapping without fracture. The test can be conveniently carried out in the rotating vice of a torsion machine, as indicated in Fig. C. A looped end of the wire is gripped in the vice and the wire threaded on as the vice rotates. In unwrapping a slight tension on the wire is necessary, as it will otherwise tend to twist.

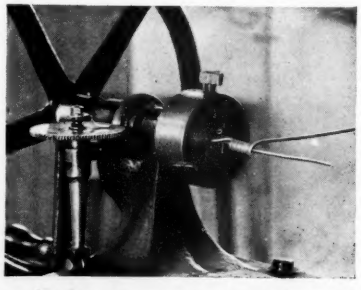

Fig. C.—The Wrapping Test requires that the wire must stand wrapping eight times around its own diameter, hence the rotating vise on the torsion machine.

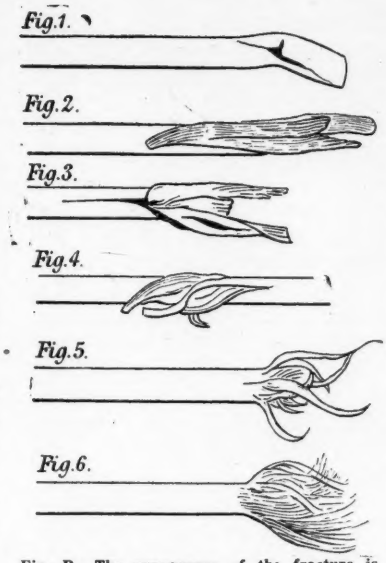

Fig. B.—The appearance of the fracture is characteristic of the material and the amount of wire drawing. These six varieties of fracture are described in the text.

Spring Test

The growing demand for high tensile steel wire in comparatively thick sizes, as a substitute for hardened and tempered wire in the manufacture of springs, has called for a new wire test. This consists of bending the wire round a given radius and noting the number of degrees through which it may be bent before there is any permanent set. The machine, which is illustrated in Fig. D, consists of a semi-circular protractor, the rim of which is engraved in degrees. Along the base of the protractor and to the right of the centre is a small vice in which the specimen to be tested is tightly clamped. At the centre of the protractor a circular die of definite radius is mounted and the wire is bent round this radius by means of a bending arm and lever. The wire is bent through an angle of 5° at a time, released and the permanent set measured. A curve can be plotted showing the number of degrees permanent set for the angle of bending. This, when compared with the curve of a wire of proved efficiency, shows whether the wire is up to standard or not.

There are a number of other machines that are used for the mechanical testing of wire in special instances, such as the machine for continuous testing. It naturally arises that a coil of wire which has to be in one piece must of necessity have no hard or brittle spots nor any soft spots. Under these conditions the whole length of the wire has to be put through a proof load prior to despatch. The patent machine for putting a proof load on the whole coil of wire is shown in Fig. E. The machine consists of two rotating tapered drums for holding the wire, a leading drum for holding the coil and a winding drum for receiving the wire after testing. The coil of wire to be tested is placed on the drum on the left of the picture. The wire is led round the left hand of the two middle drums and has about 10 or 15 turns of wire put on it before the leading end is carried to the third drum. This drum has also 10 or 15 turns before it is finally led off to the winding drum.

Continuous Proof Load

Between the two middle drums, which are about 1 foot 6 inches apart, there is a length of wire of about 4 feet. On this length of wire is supported through a small pulley the proof load in lbs. that the wire has to stand. The procedure for this test is—the wire is led off from A to the left hand side of B. By virtue of the taper on the drum B the wire comes off at the right hand end, is threaded round the pulley bearing the weights and then led on to the drum C. This drum also being tapered unwinds the wire from the left

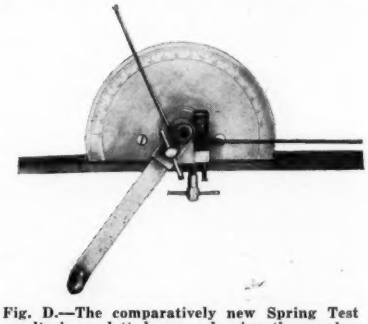

Fig. D.—The comparatively new Spring Test results in a plotted curve showing the number of degrees of permanent set for the angle of bending. This is compared with the curve of a wire of proved efficiency.

hand end, which is taken up by the drum D. As there are as many as 15 turns on each of the middle drums, it ensures that there will be no strain on the wire as entering the drum B or leaving the drum C.

This is an expensive method of testing a piece of wire, and it is generally conceived that, if the wire has been properly treated throughout its manufacture, its mechanical properties can be as surely determined by testing both point and back ends for tensile, torsions and bending.

Alternating Stress Testing

A test, which has come in to specifications recently and which is probably one that will become more common, is the Fatigue Test. It is probably the most important test of all, more particularly in the manufacture of wire for wire ropes. In making a wire rope for any particular purpose it is usual to base the actual Breaking Stress of the rope on a definite number of times the load that it will have to stand in actual practice. In some cases this factor is as low as 4 to 1 and in the case of mining ropes as high as 10 to 1.

The reason for this factor of safety is that in the past it has been found that ropes will fail in service after a period of work, even though considerably less than the actual Breaking Stress has at any time been put upon it. Laboratory experiments by Wohler as early as 1871 prove that, after repeated loading with stresses well below the yield point, ductile metals fail through the formation of cracks.

In following up these tests with more up-to-date machinery metallurgists have established that there is what is known as a Fatigue Limit for all metals, and that, provided this limit is not exceeded, metals will stand up indefinitely to the uses to which they are put. But once this limit is exceeded permanent injury is done to the metal and failure will only be a matter of a short time.

It has also been established that for ordinary heat treated materials this Fatigue Limit bears some relation to their Elastic Constants. In cold worked materials, however, the position of the Elastic Limit is not definite, so that in determining the Fatigue Limit of any cold worked material, either in the form of bars or wire, the Elastic Limit cannot be relied upon to furnish any idea as to its position.

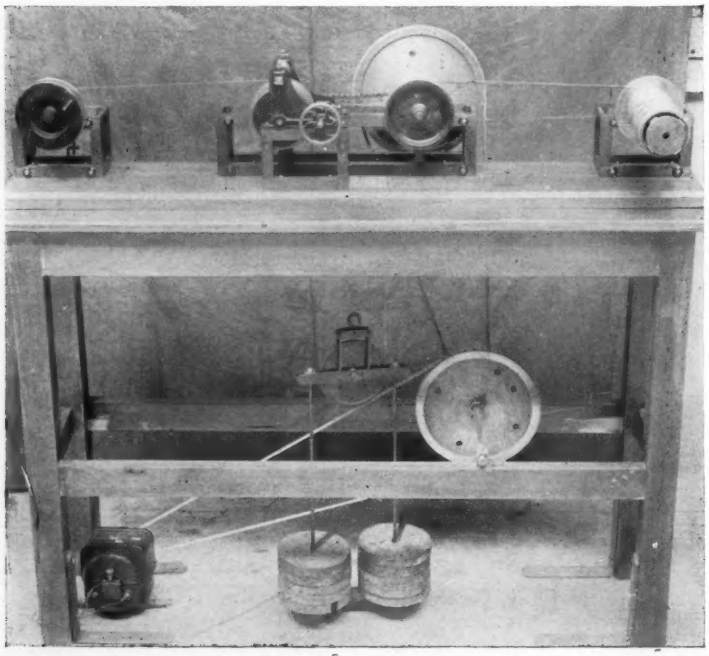

Fig. E.—A machine for the continuous testing of a whole coil of wire. The length of wire is unwound from the drum at the left, passed through a proof load, and wound again on the drum at the right.

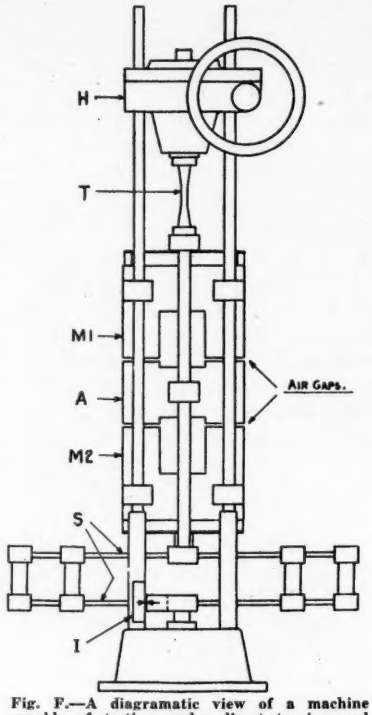

Fig. F.—A diagramatic view of a machine capable of testing under direct tension and compression, alternating between equal or unequal loads and in pulsating tension or compression.

To ascertain the Fatigue Limit of a wire an Alternating Stress Testing Machine is brought into use. The object of this machine is to apply known loads to a test piece at a comparatively high frequency and to endeavor by simulating actual service conditions to break down the wire in a short space of time. By means of a series of test pieces under different loads a curve can be drawn, showing that, with the decrease of load, the number of reversals of stress which a wire will stand will materially increase until a load can be found at which the specimen will stand an infinite number of reversals without fracture.

Machines of this type are of two kinds:

(1) Rotating Beam Machines, in which the specimen to be tested, is held in a Rotating Chuck and equal tension and compression are applied by loading the free end, so as to slightly bend the specimen.

(2) Machines in which the loads—tension and compression—are directly applied over a fair length of the specimen.

The number of reversals of

(*Please turn to page 318*)

Research Helps New England Industries

New products, profitable side lines and salvage of waste have resulted from intelligently directed study

MANUFACTURERS of wire and wire products are represented in the selections made here from the reports of a recent survey of the uses of research in New England industries. The survey was conducted by the Policyholder's Service Bureau of the Metropolitan Life Insurance Company in cooperation with the research committee of the New England Council, a group of manufacturers.

Inventories Reduced 58 Per Cent

THE Morgan Construction Company of Worcester, Mass., manufactures wire mill machinery, rolling mills for the making of billets , sheet bar, merchant bar, hoops, strips, wire rods, also gas producers and steel melting furnace controls.

For the last three years the company has maintained a special department to study standardization and simplification. This department is under the direct supervision of the Vice-President. Its activities have contributed largely to reducing inventories 58 per cent.

The proper selection and simplification of materials has been of vast importance in keeping machines working with the least confusion and change. There are many uses and designs of machines specified by the steel trade which are called for too infrequently to warrant their manufacture. These styles have been eliminated with the usual economies resulting from simplification.

As roll housings were formerly built in a total of fifty different sizes and types this number is now reduced to two types, with twelve sizes in each type, or twenty-four in all. Pinion housings were formerly built in three types requiring thirty different sizes. The company now puts out one type which comes in twelve sizes. This procedure is being applied to the entire production of the company so that specific sizes and types are prescribed for all machines. As a result, materials for service requirements can be easily stocked. Repair orders will be met more promptly. The cost and storage of patterns is lowered and there is also a lowered cost for jigs and fixtures.

The biggest saving brought about through standardization and simplification has been made possible through the decrease in inventory. For instance, mill construction calls for quantities of angle iron. To meet the former requirements of many sizes and many types for each machine produced, it was necessary to carry in stock seventy-four different sections. Under the present practice it is necessary to carry only eleven different sections and all new developments must conform to the required standards.

A Market For Short Wire Lengths

Wire and wire products for electrical equipment manufacturers and radio manufacturers are the products of the Acme Wire Company of New Haven, Conn. The Company is primarily a specialty manufacturer and makes to customers' specifications.

Hook-up wire for radio work is specified in 30-inch lengths. The company's practice in the past has been to throw away the short lengths of wire resulting from making up the standard lengths. In an effort to eliminate this waste of material, the company made an investigation to determine what, if any, commercial uses could be found for short wire lengths. As a result, it was learned that wire in lengths of 3 inches and over could be used as lead wire in radio condensers and was, in fact, well suited for this purpose. Thus a profitable use was discovered for a former waste products.

A Brass Fabricator's Methods

The Scovill Manufacturing Company of Waterbury, Conn., fabricators of brass goods, has adopted three effective ways of improving its products; first, by maintaining a uniformly high grade of raw material, second, by constantly overhauling and renewing mechanical equipment and third, through continuous development work carried on in a research laboratory. The company was one of the first to experiment with the use of oil furnaces for brass melting and also pioneered in the installation of electric furnaces, now used throughout the plant for all melting.

Automatic machines are investigated as soon as they appear on the market. Many such machines are designed and built at the plant. As quickly as the worth of a machine is demonstrated under experimental conditions, it is transferred to the production departments. The company is constantly overhauling and renewing machinery and equipment, and making replacements all along the line. Such replacements result in greater economy of production, and make it possible to put out a higher grade product of more uniform quality.

The research laboratories of the company are used both for control and development work. Extensive study has been given to controlling the quality of brass rod with such success that the present uniform quality of rod has materially facilitated after-processes.

A New Idea In Watch Chains

For the last ten or fifteen years, men's watch chains have followed more or less the same general style tendencies, although there have been a great many variations in design.

(*Please turn to page 317*)

Wire Nails in the Making

In one Canadian plant a hundred automatic machines are daily producing more than five hundred varieties of wire nails

By D. M. Duncan, B. Sc.

*Associate Editor, Canadian Machinery and Manufacturing News**

NEXT in importance to wood comes nails. Without nails the facility for using wood for construction purposes would be absent. As a result nail-making is an important industry.

There is no end to the variety of types, sizes and gages, and in the plant of the Graham Nail Works, Toronto, operated by the Canada Metal Co., more than a hundred machines are at work daily on the production of nails. More than five hundred different sizes and gages and patterns are manufactured in this plant, the smallest type being about ¼ inches long, and the largest 14 inches.

The process of nail-making is one that is not generally known, although considerable interest is exhibited in it, both by the layman and mechanic, due to the importance of nails in everyday life and the ingenious machinery employed in their manufacture.

The standard wire rod used in the manufacture of wire nails from No. 7 downward is No. 5. In its crude form No. 5 rod is shipped into this plant in coils weighing 150 lb. each, correspondingly larger and heavier rods being required for the manufacture of nails of heavier gage. The rod is drawn from the yard in one-ton loads on trucks especially constructed to maintain the wire in the best position for handling in the processes through which it passes in bulk.

Handled by Automatic Cranes

From the yard the rod passes to the cleaning house where it is handled by automatic cranes and dipped in a pickling vat containing boiling sulphuric acid for the purpose of removing the scale oxide formed at the rod mill while undergoing hot rolling. It is then transferred to a trough of cold water in which it is rid of adhering acid in order to stop corrosion. From the trough it is further subjected to immersion in a hot alkaline solution, the base of which is lime, and without further washing placed in a baker oven.

Fig. 1.—Rod is handled by automatic cranes, dipped in a pickling bath, and coated with a lime solution which is later baked on.

The baker oven is electrically heated, a temperature of 460 degrees Fahr. being maintained. As a result of this liming and baking the rod recovers various properties lost in the pickling process. In pickling the acid seems to penetrate the material, partially destroying its tensile properties and so embrittling it that without further treatment it would be unsuitable for drawing. This weakness is, however, remedied in the baker oven where lime at baking temperature serves to draw the acid of the material, restoring uniformity and a high degree of homogeneity, as well as toughening, for final wire drawing. The rod, when placed in the baker oven, is wet from the lime solution, but as it emerges, a fine white deposit of lime adheres to its surface, which is otherwise very smooth. This limed surface is intentional, as later, in wire drawing, it mixes with soap, forming a highly suitable lubricant.

Drawn Down To Size

The rod is next transferred to the bench, where it is drawn down to the requisite sizes for the manufacture of tinned, galvanized, or copper-coated wire, or for wire nails. The drawing bench has five or six blocks which receive their driving power from a horizontal shaft located beneath the bench. The vertical drive necessary to operate the blocks is effected through bevel pinions at intervals along the shaft, driven from a 75 h. p. motor. The motor speed of 750 r. p. m. is stepped down through a single reduction helical gear to a speed of 148 r. p. m. in the main horizontal shaft.

In wire-drawing each gage of wire has its characteristic speed, the rule being generally that the heavier the gage the slower the drawing speed, or the lighter the gage the higher the drawing speed. The drawing speed is usually determined by the diameter of the drawing block, and is seldom adjusted by varying the

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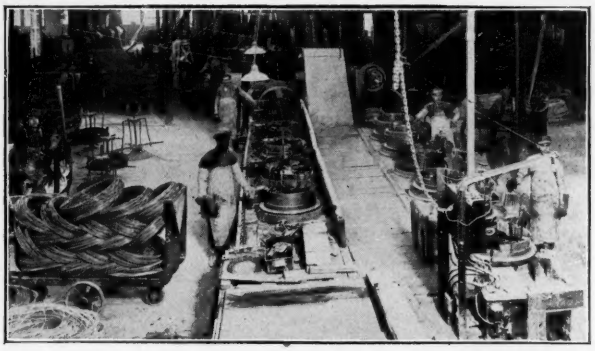


Fig. 2.—In a five-block drawing bench the rod is drawn from No. 5 gauge down to No. 2 gauge in five stages without annealing.

speed of the vertical shafts driving these blocks.

From No. 5 standard commercial all sizes of wire from No. 7 downward are drawn. The advantages of using a high quality of rod can be realized when it is known that with lower grades of rod it is scarcely possible to make more than two drawings without annealing. In the Toronto plant described this is avoided as far as possible in the interests of economy and rapidity of production. In a five block drawing bench the rod is drawn from No. 5 gage down to No. 20 gage in five stages without annealing, effecting a valuable saving of time and labor.

Soap As Lubricant

The rod is placed on reels convenient to the block on which it is being drawn, and fed through a device containing soap, which mixed with the lime forms a satisfactory lubricant, preventing seizure of the wire to the die. It might be mentioned that in its original crude state it is impractical to draw the wire due to the surface scale of oxide which is hard and brittle, acting like sand and destroying the surface of the wire, hence the pickling and liming.

The drawing is consecutive so that when one gage is secured it is taken to the net reel on the bench and drawn to a still smaller size, the process being the same in every case. Hard steel or chilled cast iron dies are used to withstand the rigorous wear to which they are subjected. The type of dies favored are solid blocks about 2 inches thick bored with several rows of holes tapering from ¾ inches down to the gage of the wire. As, from friction and abrasion, each hole becomes worn beyond the correct gage, another is used until the die is no longer of use for that particular gage of wire, whence it is converted to take a larger gage. The actual life of a die cannot be definitely stated without stating also the amount of reduction it is called upon to perform. Some dies last six months, while others of the same material may last for two years.

It might be supposed that considerable difficulty would be experienced in getting the end of the wire through the die, but this is simplified by the provision of a pointing machine that will roll down the wire for a sufficient portion of its length to enable it to pass through the die and be attached to the wire block upon which it is to be wound. This device, in the form of two grooved rollers of three or four inches in diameter, is actuated by an eccentric drive from the shaft beneath and controlled, like the wire drawing blocks, with a clutch.

From this stage the wire is taken to the straightening machines, to the nail-making machines or to the annealing furnace, according to the purpose for which it is intended. For certain purposes, such as bale ties, annealing is necessary and is conducted in a large specially constructed annealing furnace. This furnace is coal-fired and fed from overhead.

In the furnace a crucible with a capacity of 4 tons of wire of all sizes has a lid with which it can be sealed from oxidizing influences during the annealing. The temperature of the furnace is maintained at 1,450 degrees Fahr. For nail making annealing is not necessary, unless it might be so to bring the wire to the required gage in the first place.

Nails Formed Automatically

There is nothing complicated about nail-making machinery, although its operation is automatic. Such an idea is engendered by the extreme rapidity with which nails are produced, the rate being much too rapid to be followed by the human eye when working at maximum speed. In setting up a machine to accommodate a particular length and gage of nail, pointing and shearing dies are fitted and the stroke of the machine set and timed to execute the necessary operations in their proper sequence. Once set, the machine feeds, heads, measures

(*Please turn to page 315*)

Fig. 3.—Two men operate twelve machines. Once the dies are set, the machine feeds, heads, measures and points each nail separately.

Simplifying the Lay Problem in Wire Rope

Much of the confusion about terms used in specifications is dispelled by an understanding of the construction

By Oscar Hellgren

Wire Rope Splicer, Youngstown Sheet & Tube Co.

THROUGH my contact with several operating engineers who work in various plants throughout the Chicago district, I have noted a marked confusion of thought among these men as to the basic difference between the seemingly conflicting terms set down as the title to this paper. The exact province of the varying kinds of "lays"—just what each means and where each belongs—is not so thoroughly understood as it should be, even by men who are eminently capable as operating engineers. To the old hand, of course, these terms are elementary. For many, however, even extending to those in supervising or purchasing capacities—the terms that are so essential to intelligent use and application of wire rope seem only to contribute to clouded understanding and erroneous impressions. It is with the thought that much of this confusion might be clarified that I am setting forth the following facts.

Perhaps it is not to be wondered that many engineers carry impressions similar to one operating friend of mine who believed that "Lang Lay" was a trade name signifying an individual brand of rope, or to a maintenance man of my acquaintance who seemed quite surprised to learn that "Tru-Lay" did not signify a particular type of rope that differed in construction from ordinary ropes.

At another plant an engineer was found who entertained the fallacious belief that "Right" and "Left" lay had no relation to either "Lang" or "Regular" lay; while yet a fourth friend of mine, a locomotive crane operator insisted upon ordering his rope by such specifications as "7/8"—6x19 Plow Steel", expecting the rope manufacturer to supply his order without delay or confusion.

IN ordering wire rope, says the author, there are nine distinct pieces of information required. These are:

1. Length of rope.

2. Diameter of rope. (Before replacing an old rope it is always well to gauge the sheave to ascertain whether it has been worn to an extent that will cause excessive abrasion or pinch the new rope. New sheaves are cheaper than wire rope.)

3. Numerical construction — the number of strands by the number of wires in each strand. For instance: 6x7, 7x9, 6x19, etc.

4. Type of construction—such as "Seale", "Spacer Seale", "Guy", "Warrington", etc. If in doubt or ignorance of the exact construction, consult a qualified wire rope engineer.

5. Grade—whether Plow Steel, Improved Plow Steel, etc.

6. Direction of Lay—whether Right or Left.

7. Type of Lay—whether Lang or Regular.

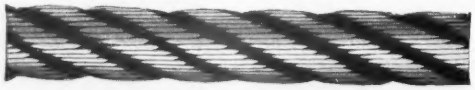
8. Type of core—whether hemp center or wire rope center.

9. A full description of the class of service for which the rope is intended.

What "Construction" Means

Just a word about the construction of wire rope may be helpful to many. The wire rope that is commonly employed for practically all commercial purposes is made up into any one of 42 different constructions and in any one of six varying metals. There are, of course, many more than 42 different and distinct constructions, but by far the greater percentage of all wire rope service is performed by one of the 42 standard constructions. These varying constructions are designated by names such as "Seale", "Spacer Seale", "Warrington", "Tiller", etc., etc.

Fig. 1



Partially Worn Regular Lay

Partially Worn Lang Lay

Photos courtesy American Cable Co.

Practically all these several constructions are available in any one of six grades of material, which are: "Iron", "Toughened Steel", "Cast Steel", "Mild Plow Steel", "Plow Steel", and "Improved Plow Steel". While it is quite impossible to set up an arbitrary table of wire rope application to definitely limit the province or define the service of any one rope, it yet remains that each of these 42 constructions and six different grades have places where they serve best and other places where, because they would be misapplied, would fail to give their full service life.

In determining just which type of wire rope will best meet given conditions it always pays to consult a qualified rope engineer. Only through a knowledge of the working requirements and the condition of the auxiliary equipment can wire rope properly be specified.

Construction or grade of rope has no influence on its "lays", however. For instance, a 1¼" 6x19 Spacer Seale (which is to say: a 1¼" diameter rope that is made up of six

strands of 19 wires each and in accordance with a construction known as "Spacer Seale") might be either Left Lay Lang Lay, Right Lay Lang Lay, Left Lay Regular Lay or Right Lay Regular Lay.

"Lay" signifies the manner in which the individual wires and strands are laid into the completed rope. The rope that is most commonly used is that of "Regular" lay—so-called because the wires in the strands are laid in the opposite direction to that in which the strands are laid into the completed rope. This is illustrated in Fig. No. 1, and is commonly used in this country because, back in the old days when wire rope was forcibly twisted together rather than preformed (which meant locking within the rope a great deal of torsional stress) the internal stresses found themselves working in opposition to each other —in one direction in the strands and in the opposite direction in the completed rope—with the result that the stresses did much to equalize themselves and make the rope less likely to kink, much less "cranky" and easier to handle than would be the case if both strand and completed rope stresses were pulling in one direction. Whether the rope be Left Lay Regular Lay or Right Lay Regular Lay depends entirely on whether the strands are laid into the rope clockwise or counter-clockwise.

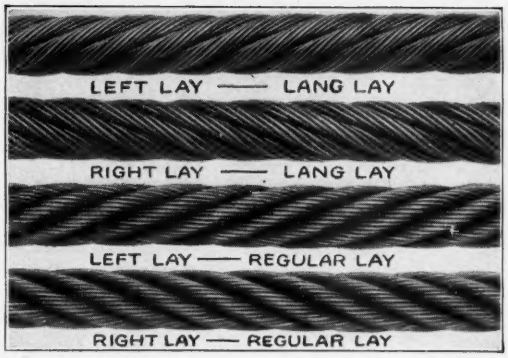


Fig. 2

Advantages of Lang

In an effort to provide the individual wires with a greater wearing surface and gain a more flexible rope, the principle of laying the wires and the strands was reversed. That is to say, the strands were laid into the completed rope in the same direction as were the wires into the strands. Fig. No. 1 illustrates this type of rope also. This is called "Lang Lay" rope.

As might be expected, this "Lang" lay rope offers several advantages over "Regular" lay ropes, chief among which are:

(a) Greater wearing surface, each outer wire having approximately three times the length exposed for wear. (See Fig. No. 2).

(b) Greater flexibility, because the outer wires of the strand are parallel to the axis of the rope against the manila core and therefore, set up less frictional resistance between themselves when bending.

(c) Lower bending stresses, the bending stress in a Lang Lay rope being approximately 80 per cent of that in a Regular Lay rope of the same construction and length of Lay.

Disadvantages of Lang

However, there are several disadvantages to Lang Lay over Regular Lay rope, two of which are:

(a) When using Lang Lay it is absolutely essential that all auxiliary equipment, (sheaves, etc.) be in the best of condition since a pinching sheave, for instance, will more readily deteriorate Lang Lay than Regular Lay rope. It will be obvious that to squeeze or pinch a Lang Lay rope—where the wires within the strands lay in the same direction as the strands within the rope—will more readily force the wires or strands to lift out of their proper place. This is called "bird caging"—a fault common to Lang Lay ropes that are made in the old way.

(b) By reason of the unopposed internal torsional stress in the non-preformed Lang Lay rope it has a great tendency to kink, be "cranky" and hard to handle. In addition, it will "bird cage" more readily than Regular Lay and because of this fact is quite unsuited to tasks where there is a need for elasticity or sudden stopping and starting. In oil well drilling, as an instance, Lang Lay rope would be unsuited to the work of drilling because of the liability of the rope to "bird cage" due to the oft-repeated sudden jars.

As in all ropes, Right Lay Lang Lay or Left Lay Lang Lay may be determined by whether the strands are laid in the rope clockwise or counter-clockwise.

How to Order Wire Rope

Probably every wire rope manufacturer is repeatedly receiving orders which read something as follows: "Please ship us 242 feet of ⅝" Improved Plow Steel rope", or—"Ship by express 80 feet of ⅞" Seale". Such orders cannot be filled until more information is secured as to the type and kind of rope required. And when a user has an elevator stalled or a locomotive crane laid up for want of a rope the delay involved in obtaining more information is frequently very costly. Taking a few pages from my long experience regarding the proper method of ordering wire rope may save some reader a costly and aggravating delay.

Where more than one rope is used on a piece of equipment, specify which rope is required, as: a boom rope or a hoist rope on a revolving shovel. Where written properly the order that originally might have read: "242 feet of ⅝" Plow Steel Rope", would more correctly read: "242 feet—⅝" 6x19 Warrington, Plow Steel, Left Lay Regular Lay, with hemp center. This is to be used for hoist line on derrick."

If wire rope users will order their rope in accordance with these specifications they will save themselves many costly delays and assure themselves a more uniformly high average of rope service.

Bullet-Proof Wire Cloth Now Protects Banks

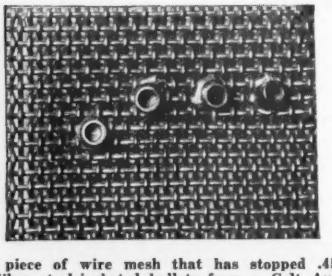
Hard alloy wire has been successfully woven into a mesh that stops bandits' bullets

IT may be rather surprising to many readers to know that already more than 500 banks in the United States have been equipped with bullet-proof wire enclosures and the idea has been extended to include pay roll stations in factories, cashier's cages, moving picture theatre booths and such places where money is handled.

According to the published records of the American Banker's Association,—daylight bank robberies are increasing to the point where they are a "one a day" event. Especially is this true in the western states,—although the east has not been spared.

The question of combating these attacks has resulted in the introduction of various protective schemes, including bandit-proof enclosures, tear gas, armed individual watchmen and the organization of vigilant associations. Usually the attacks are directed against branch banks in outlying or rural communities, though the latest report of a drive down one of the main streets of Kansas City during the Republican Convention indicates that the cities are not immune.

The bandit-proof enclosure has been most successful in resisting such attacks. It consists of the use of bullet-resistant glass for the exposed portions of bank cages, with bullet-proof metal devices for allowing communication between the customer and the cashier. These devices have been so perfected that while conversation and money can be freely exchanged the cashier is in an impregnable position and also can shoot at an intruder or sound an alarm while safe from harm to himself.



A piece of wire mesh that has stopped .45 calibre steel-jacketed bullets from a Colt Automatic at 18 feet.

The up-to-date bank is protected by bullet-proof wire cloth enclosures, bullet-resistant glass, and other modern safety equipment for guarding its contents against attack by armed bandits.

Wire Protects Cages

Bullet-resistant glass has really been perfected so that it will repel the bullet from any side arms. The devices consists of amplifiers set in glass, through which conversation is carried on, and a deal tray which is bullet proof but with passages arranged so that while papers or money may be passed in or out, a gun cannot be effectively aimed within the enclosure and a shot would imbed itself in the bullet-proof lining.

With all this arrangement, however, it was found that the bandits could very easily climb up on the ledge of the counter and intimidate or shoot the bank employees from the top of the cage screen. The problem of combatting this difficulty was put up to Mr. John C. Scheeler, President, and Mr. Charles A. Scheeler, Vice President, of the Buffalo Wire Works Co., and the efforts of the engineers of that company were devoted to finding a material which would answer the purpose.

It was necessary to devise a wire mesh cloth which would stop a bullet and which at the same time would afford ventilation and not entirely shut off the light. The ordinary wire cloth closely woven of common wire was found to be useless as it would hardly stop a 22 calibre bullet and the modern bandit is not found carrying toys of that calibre.

Messrs. Scheeler and their associates experimented with various alloy wires to obtain the proper resiliency and hardness and wire workers will appreciate the difficulties encountered in weaving this cloth in a fine mesh with the heaviest wire which it was possible to use for such a mesh—while the actual tests showed the necessity of using a special hard alloy wire. It was really necessary to construct a special machine for the weaving of this cloth and after considerable expensive experiment the desired results were accomplished.

The bullet-resistant wire cloth was patented and copyrighted (BAN-TEX) and has been subjected to severe tests by the Underwriter's Laboratories, police departments, money truck builders and the manufacturers. Figure 1 shows

(*Please turn to page 317*)

Electric Storage Battery Aids In Hauling Heavy Cable

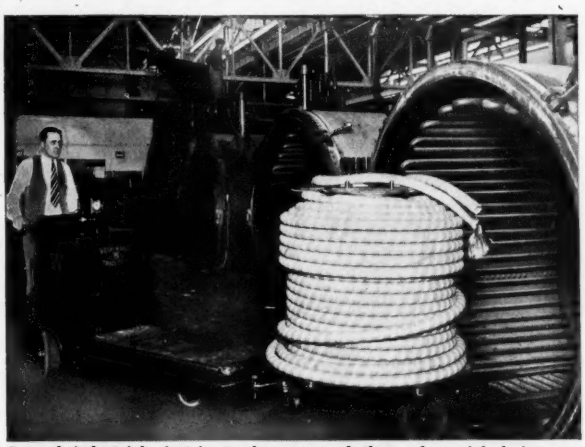
Westinghouse cable plant uses a battery-powered locomotive, locomotive crane, and several types of industrial trucks for materials handling

By O. W. Cooley

Reprinted, by permission, from the Edison Monthly

THE electric storage battery is in many ways one of the most remarkable inventions of all the family of electrical wonders. It is quiet, compact, readily portable, and subject to a host of applications. Considering its size, it is very mogul of stored power, quickly available, and while in actual use independent of any outside source of energy.

The use of the storage battery most familiar to this swiftly moving age is in the automobile, where it provides the spark to ignite the combustible mixture. This is a comparatively small edition of the battery, as is also the type which is widely used as an adjunct to the radio. Many are familiar with these applications of the storage battery who perhaps do not know that central electric generating stations employ huge batteries, working on the same principle, to store reserve electricity for posible emergencies; and who may not be aware that the sole motivating power of a submarine while submerged comes from the cells of large storage batteries.

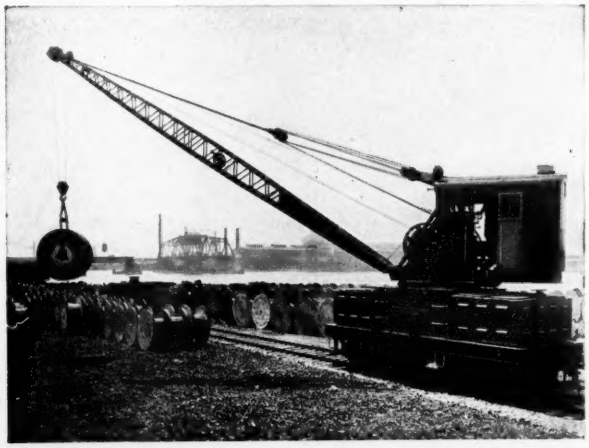


Several industrial electric trucks, many of them of special design, are used in and about the Kearny plant to handle the great bulk of heavy materials that go into the manufacture of cable.

It was early recognized that if the electric storage battery could be made to move cars and locomotives, liberating them from the necessity of constant contact with a trolley wire or third rail, it would be a great boon to transportation. This has been done, and the storage battery has been adapted to many different types of freight and passenger vehicles, to the great benefit of industry and modern life.

These vehicles can be classed in three general groups: electric street trucks and passenger automobiles, electric industrial trucks, and electric storage battery locomotives. The two last named types are used extensively in and about large industrial plants for moving the great quantities of materials used in the processes of manufacturing. Such a plant is the Kearny (N. J.) Works of the Western Electric Company, where thousands of tons of telephone cable and apparatus are manufactured.

(*Please turn to page 313*)



This storage battery locomotive crane handles 13,000-pound reels of cable at a 50-foot radius. Both the motor for hoisting and the one for moving the locomotive are motivated by power from the 100-cell battery.

NEWS *of the* INDUSTRY

Foreign Trade Opportunities

Foreign trade opportunities reported by the U. S. Bureau of Foreign and Domestic Commerce during the month of August include inquiries from the following sources:

For electrical wiring supplies (32612); for pin and needle manufacturing materials, including machinery and packing equipment, (32650) from Monterry, Mexico; for nails and spikes (32731) from Habana, Cuba; for wire fencing and barbed wire (32723) from Manila, P. I., for galvanized wire from Swatow, China (32779); for plain and barbed wire from Habana, Cuba (32731); for rolled wire (32735) from Berlin, Germany; for steel mill equipment (32801) from Prague, Czechoslovakia; for underground and overhead transmission wires (32989) from London, England; for electric wiring devices (32986) from Helsingfors, Finland; for wire fencing, including chain link, from London, England (32986); for plain and galvanized wire and wire nails (32898) from Habana, Cuba; for tinned wire (32970) from Montreal, Canada; for wire nails (33121) from Cairo, Egypt; for barbed wire (33120) from Habana, Cuba; and for wire for rubber hose manufacture from Singapore, Straights Settlements (33133).

Unfair Practice Dropped

The Federal Trade Commission made public August 28 the substance of stipulation No. 271 entered into with a concern dealing in wire fences. The full text of the statement follows:

No. 271.—A picture of the character known and recognized as "Uncle Sam" was carried in advertisements by a corporation engaged in the fabrication of fences from wire, along with the statement "the fence Uncle Sam recommends." Another assertion was that the wire was "just double the strength" of ordinary wire and was "double galvanized."

These statements were found by the Federal Trade Commission to be misleading. The wire was not recommended by the Government and was not double strength nor double galvanized. The manufacturer signed a stipulation agreement to cease and desist from such misrepresentation.

Wire at Safety Congress

MEMBERS of the American Society of Safety Engineers, who comprise the Engineering Section of the National Safety Council, will hold meetings on Oct. 2, 3, 4 and 5, during the seventeenth annual safety congress at five New York City hotels, which will open on Monday, Oct. 1st. More than 6,000 delegates are expected to attend and both members and nonmembers will be welcome at all sessions. The first gathering of what is known as the A. S. S. E. section is to be held on Tuesday afternoon, Oct. 2nd, in the Pennsylvania Hotel, where all meetings of that group will take place. Progress reports on "Annealing Chains" and "Wire Rope Attachments and Connections" will be presented and discussed.

After the election of officers for next year's meeting, Ralph E. Motley, of the Atlantic Refining Co., Philadelphia, will dwell on "What Is a Good Industrial Safety Program in Plants Employing from 150 to 1,000 Workers?" and F. E. Town, of the Maitowoc Portland Cement Co., will lead a discussion of "What Is a Good Industrial Safety Program in Plants Employing Less Than 150 Workers?"

Foreign Manufacturer of Machinery for wire industry requires American representative. For full information address Box 101, Wire & Wire Products, 551 Fifth Ave., New York.

Wire Complaint Dismissed

The Complaint of the Nicholas Wire, Sheet and Hardware Company against alleged unreasonable rates for the transportation of wire by the Pittsburg and Lake Erie Railroad was dismissed by the Public Service Commission on August 6. The commission held that the rates were comparable to those charged by other railroads in the same vicinity.

New Torrington Financing

The Torrington Company of Maine, which controls the Torrington Company of Connecticut, manufacturer of needles for sewing and knitting machines and also vacuum cleaners, proposes to reduce its capitalization from $10,000,000 to $7,000,000. The plan is to retire 40,000 shares of outstanding preferred and 120,000 shares of common which were never issued and to split the outstanding 280,000 shares of common two to one and reduce its par from $25 to $12.50. Stockholders will vote on the proposal on September 11.

Standardize Invoice Forms

The Machinery Builders Society, New York City, through its Secretary, Mr. W. C. Fulmer, has informed the Division of Simplified Practice of the Department of Commerce that 52 per cent of the membership of the Society now use the simplified commercial invoice form, and that 28 per cent expect to use it eventually, i. e., when present stocks are exhausted. In reporting the returns of a recent survey made of the membership,

Mr. Fulmer said that only 3 per cent stated they did not use the simplified form and gave no reason for non-use of it.

The Mossberg Pressed Steel Corporation of Attleboro, Mass., makers of reels, spools and other appliances used by wire manufacturers, in their recent report to the Associated Industries of Massachusetts, account for a substantially increased volume of business by citing examples of the result of practical research into the requirements of the trades they serve and the consequent improvement of their products. An excerpt from their report, made over the signature of Frank Mossberg, President and General Manager, is as follows: "For the last eight months, our average volume of business has been over 25 per cent more than any previous like period in the history of our business. The explanation is that we are constantly experimenting and developing new products, with a view to better meet the requirements of the trade. Some three years ago, we began in a small way to make Drop Wires for automatic loom stops. We set out to make a better wire than that generally offered to the trade. The result of this endeavor is that we have built up this part of our business to a very substantial volume.

Building and Expansion

H. Bettis Co., Inc., Wheeling, W. Va., manufacturers of wire-bound shipping containers, has purchased and will equip a branch factory at Zanesville, Ohio.

Hudson Wire Co., Ossining, N. Y., has purchased the business of the Bennett Wire Co., Norwalk, Conn., which recently filed a petition in involuntary bankruptcy. Production will be resumed under the name of the Pequot Wire Company.

Acme Iron & Wire Works, St. Paul Avenue, Milwaukee, has changed the corporate title to Acme Iron & Steel Co. The company manufactures ornamental iron work.

COMING EVENTS

Sept. 10-15. National Association of Power Engineers at Detroit. Secretary, F. W. Raven, 417 South Dearborn St., Chicago.

Sept. 24-28. American Electric Railway Association at Cleveland. Secretary, J. W. Welsh, 292 Madison Avenue, N. Y. City.

Sept. 25-28. Traveling Engineers' Association at Chicago. Secretary, W. O. Thompson, 1177 East 98th St., Cleveland Ohio.

Sept. 26-29. Railway Equipment Manufacturers' Association at Chicago. Secretary, F. W. Venton, 836 South Michigan Ave., Chicago.

Oct. 1-5. National Safety Council, National Congress, at New York. W. H. Cameron, Managing Director, 108 East Ohio St., Chicago.

Oct. 2-5. National Association Ornamental Iron and Bronze Manufacturers at Boston. Secretary, C. F. Waltz, 622 Broadway, Cincinnati, Ohio.

Oct. 8-12. American Welding Society at Philadelphia. M. M. Kelly, Secretary, 33 W. 39th St., New York City.

Oct. 8-12. American Society for Steel Treating at Commercial Museum, Philadelphia. Secretary, W. H. Eisenman, 7016 Euclid Avenue, Cleveland, Ohio.

Oct. 16-18. American Railway Bridge and Building Association at Boston. Secretary, C. A. Lichty, 310 N. Waller Avenue, Chicago.

Oct. 17-19. Society of Industrial Engineers at Rochester, N. Y. Secretary, 608 South Dearborn St., Chicago.

Oct. 17-27. Electrical and Industrial Exposition at New York. Secretary, Lincoln Bancroft, 124 W. 42d St., New York City.

Oct. 23-25. Bridge and Building Supply Men's Association at Boston. Secretary, W. D. Waugh, 322 South Michigan Ave., Chicago.

Oct. 23-26. International Association Municipal Electricians at New Orleans. Secretary H. N. Lang, Box 1864, Orlando, Florida.

Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., is building and equipping new machine shops at an estimated expenditure of about $125,000.

Lato Steel Mfg., Co., Texarkana, Texas, has been incorporated to engage in the manufacture of metal screens.

California Wire & Cable Co., Orange, California, are to build and equip a new addition to their factory.

H. T. McClusky & Sons, New Haven, Conn., manufacturers of wire goods, are building and equipping a new addition to their plant on Grand Avenue.

Olson Brothers, Plainville, Conn., manufacturers of screw machine products, are planning a one-story factory addition.

National-Harris Wire Co., Newark, New Jersey, has moved to new factory quarters at 195 Verona Avenue. The executive offices remain at 133 Orchard Street, Newark.

United Wire & Steel Company, Fresno, California, has been incorporated to sell, trade in and manufacture steel wire products. Authorized capital is $25,000. Directors are J. M. Frawley, T. C. Braxil and A. A. Scott, all of Fresno.

Obituary

Joseph D. Bascom, one of the founders of Broderick & Bascom Rope Co., St. Louis, a city in which he had been a resident for fifty-two years, died at his home there on August 6 at the age of seventy nine. Mr. Bascom was born in St. Louis in 1849 and began his business career in 1862 as an errand boy in a retail clothing store. With a friend and partner, Broderick, he entered the wire rope business in 1876.

Funeral services for the late Alfred D. Carnagy, General Superintendent of the wire rope division of John A. Roebling's Sons Company, were held from his home in Trenton, N. J., on August 1. Mr. Carnagy, who was born in Delaware in 1857, was first employed as a telegraph operator on the Pennsylvania Railroad. In 1886 he began his career with the Roebling company as a telegrapher and assistant pay roll clerk. He had been superintendent for thirty years.

Sleeper & Hartley TRADE MARK

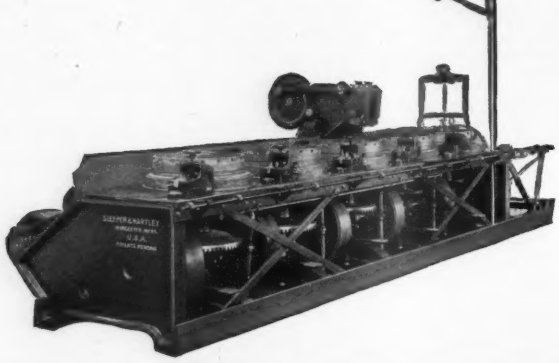
Practical Continuous Wire

These Machines Go Into Production at once—Re

Rod Frame

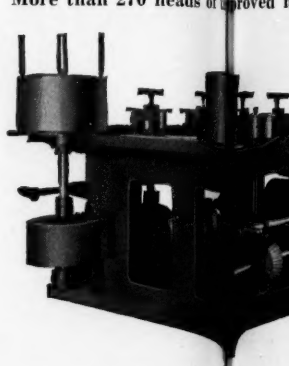
(No. 5—14 or 15 wire)
Patented June 3, 1924—May 12, 1925—others pending

All Ball or Roller Bearings
No Differential Gearing.
Automatic Compensation for Speeds of Heads.

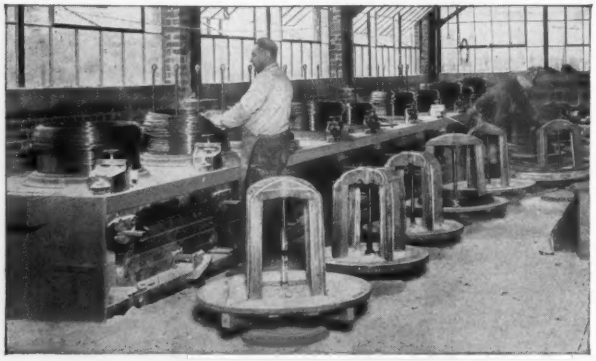


Double 5-Drafty, In

No. 14 to No. 23. For low
3 to 4 Blocks Average C
No. 14 to 19—4 to 400 lbs
No. 14 to 20—5 to 100 lbs
More than 270 heads of improved r



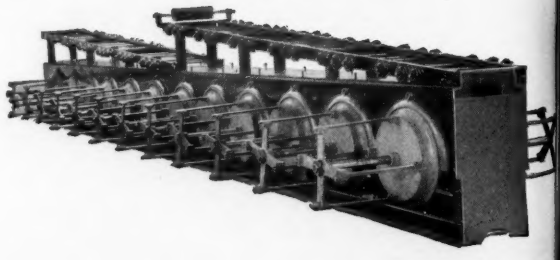
IMPROVED WIRE MILL EQUIPMEN



Standard Rod Frame—10 Block

Long, Stiff Spindles, in anti-friction bearings, and equipped with friction Clutches. Powerful and reliable. Practically noiseless in operation.

(New Plant of Thompson Wire Co., Worcester, Mass.)



Patenting Furnace Take-Up

(New Plant of Thompson Wire Co., Worcester, Mass.)

Doub

Direct dr
friction
(New

AGENTS: CHICAGO TERRITORY, Neff, Kohlbusch & Bissell, Inc. SAN FRANCISCO AND LOS ANGELES Louis G. Henes

SLEEPER & HA

FOREIGN AGENTS AND REPRESENTATIVES: UNITED KINGDOM—Mr. Fredk. A. Perry, 63 Queen Victoria St., London, E. C. 4. FRANCE—Mr. Edgar Bloxham, 12 Rue du Delta, Paris. BELGIUM—Isbecque, Todd & Cie., 25-27 Boul. Emile Bockstael, Brussels. MONTREAL AND TORONTO—Arthur Jackson Machine Tool Co.

WORCESTER, MASS

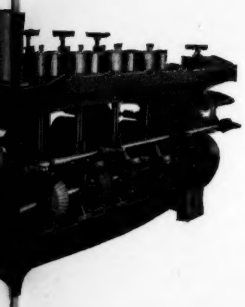
re Drawing Machinery

Sleeper & Hartley TRADE MARK

—Reducing Overhead-Increasing Production!!

ry, Intermediate

or low carbon wire.
rage Operator.
400 lbs. per block.
100 lbs. per block.
proved model in operation

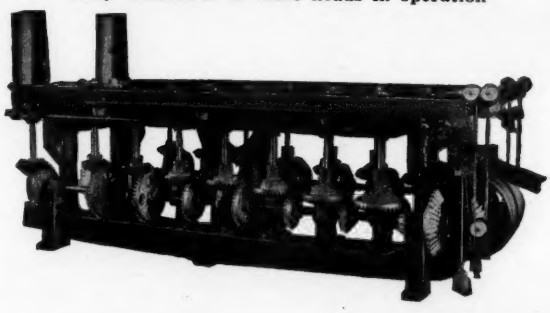


Double 8-Draft Fine Wire: Wet

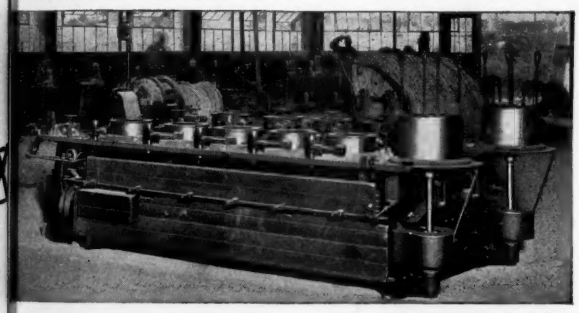
No. 22 to 36. High or low carbon wire.

6 Blocks to Average Operator, 22-33, 8-hole, 660 lbs. per day of ten hours.

Many thousands of these heads in operation



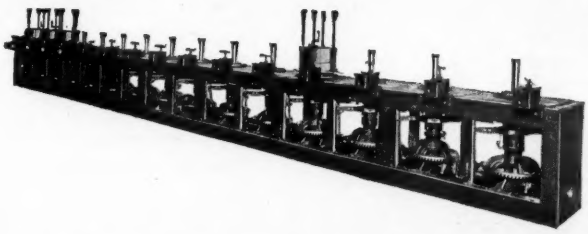
ENT RECENTLY INSTALLED



Double Six—Draft Dry Continuous For High Carbon Wire

Direct driven with silent chain. Cut gears throughout. Anti-friction bearings. Variable speed for finishing block.

(New Plant of Thompson Wire Co., Worcester, Mass.)



Heavy 16" Frame For .65 Carbon Wire No. 10½ to .037"

15 Blocks: Motor driven. Silent chain. Anti friction bearings and cut gears throughout.

(New Plant of Johnson Steel & Wire Co., Worcester, Mass.)

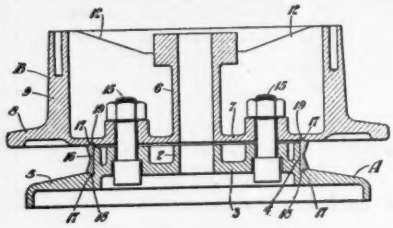
ARTLEY, Inc.

Agents: Philadelphia Territory
Swind Machinery Co.

ITALY—Henry Coe & Clerici, Milan. AUSTRALIA AND NEW ZEALAND—Edwin Wood Pty., Ltd., Melbourne.
JAPAN—Andrews & George Co., Toyko. SWEDEN AN D FINLAND—Maskinaktiebolaget Karlebo, Stockholm.

ASS., U. S. A.

A REVIEW OF RECENT PATENTS



1,675,822 Wire Drawing Block

Detailed technical descriptions are given only for the devices illustrated. All other descriptions of patents listed on this page have been abstracted from official records.

1,675,822. WIRE-DRAWING BLOCK. Stanley Pushalski, Cleveland, Ohio. A wire drawing block composed of two parts arranged one above the other and rigidly bolted together, each of said parts having a wire receiving drum formed thereon, circular grooves formed in opposite faces of said parts, said lower wire receiving drum being provided with a continuous one-piece removable metallic wearing ring, vertically extending flanges on the edge faces of said ring extending into said grooves whereby said ring is fixedly clamped between the parts of said block, and said ring having its wire receiving face constantly tapered inwardly from each edge toward its center.

1,676,598. SPRING-FORMING MACHINE. William H. Bleuel, Detroit, Mich. In a spring forming machine wherein springs are formed from wire stock, a mandrel on which the wire stock is formed, means for feeding the wire stock to the mandrel, a convolution former adjacent said mandrel and against which former the wire stock impinges and is coiled, a spring actuated rock shaft supporting said convolution former to move the said former away from said mandrel, a slide bar retaining said convolution former in a defined position relative to said mandrel, and a pivoted guide adapted to be adjusted relative to said mandrel and former to cooperate with the latter in regulating the size of a spring convolution.

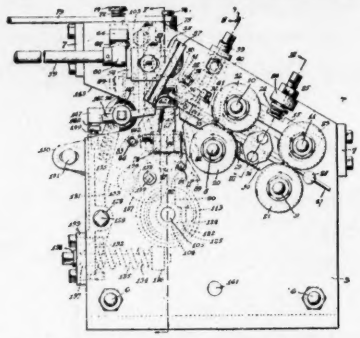
1,675,650. WINDING MACHINE. Martin B. Grout, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. A welding machine including a rotating spindle, a coil receiving member supported by said spindle, a strand of material adapted to be wound upon said coil receiving member, and automatic means including a rotatable cam adapted to engage a feeding bracket associated with a feeding bar adapted to enter said spindle to engage the said coil receiving member for moving said coil receiving member relative to said strand of material to space the strand of material upon said coil receiving member.

1,675,730. TENSION DEVICE FOR WIRE-TYING MACHINES. Frank Rychlewski, Chicago, Ill., assignor by mesne assignments, to The Gerrard Company, Inc., San Francisco, Calif. A tensioning device for wire tying, embodying a head provided with a tie-engaging member, a second tie-engaging member movable relatively to the first-named member and cooperable therewith in producing a tie-receiving space, and means operable for holding the second member in spaced relation to the first member, said head being movable bodily for bending an inserted wire tie and for effecting a gripping engagement by said two named members with said tie adapted to be inserted into said tie-receiving space.

1,675,746. WIRE-TIE-TWISTING APPARATUS. Adelmer M. Bates, Chicago, Ill., assignor, by mesne assignments, to Bates Valve Bag Corporation, Chicago, Ill. In combination, a tie-twisting tool, means for supporting and operating the tool with its axis substantially horizontal, a receptacle mounted above and to the rear of the tool and adapted to contain ties arranged substantially horizontally and parallel with the axis of the tool, the end of the receptacle towards the tool being open and there being a slot in the tool adapted to receive the end of a tie, and a guide between the receptacle and tool narrowing to a slot above the tool and adapted to guide the rear end of a tie into the slot in the tool when the forward end of the tie is pulled foward from the receptacle and over the tool.

1,675,747. MACHINE FOR SEVERING WIRE FABRIC. William E. Bowler, Niagara Falls, N. Y., assignor to The Spirella Company, Meadville, Pa. Wire fabricating mechanism for forming a wire fabric, severing mechanism to which said fabric is fed, a clutch for intermittently actuating said severing mechanism, an automatically reversible mechanism, and means controlled by said reversible mechanism for actuating said clutch.

1,675,779. CLINCHER FOR WIRE-STAPLING MACHINES. Howard G. Allen, Niagara Falls, N. Y., assignor to Morrison Stitcher Corporation, Niagara Falls, N. Y. A clincher for wire stapling machine provided on its face with a plurality of guide grooves arranged parallel and lengthwise of the clincher, each of said grooves being of the same V-shape cross-section throughout its length; and the summit of the walls between adjacent grooves being flat and of the same width throughout the length thereof.



1,676,589 Spring Forming Machine

1,677,186. STRAND-WORKING MECHANISM. Frederic Shields Kochendorfer, River Forest, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y. In an apparatus for severing a strand into lengths, a guideway, a continuously moving belt for moving the strand ing mechanism, means adjustably along said guideway, a strand severpositioned along the guideway and actuated by the moving strand for controlling the operation of said severing mechanism, and means for moving the guideway to discharge the severed strand therefrom.

1,677,927. CABLE-MARKING MACHINE. Allen D. Pettee, Mount Vernon, N. Y. A machine for measuring and marking cable including a stamping head carrying a numbering device, electrically operated means for moving said head to impress a number on said cable, and a measuring wheel actuated by the movement of the cable and arranged to control the operation of the head moving means.

1,677,195. FENCE CONSTRUCTION. Hugo Miller, Colby, Wis., assignor of one-fourth to (Mrs.) Ida Steinert and one-fourth to Emil Meyers, Colby, Wis. A fence post attachment consisting of a member having two sides, pieces joined together to form an angle, the end portions of said angle member being adapted to extend longitudinally of the fence post and being shorter than an ordinary fence post, so that it can be attached to a post after the latter is inserted in the ground, and said member being provided with rectangular slots of approximately one-half the depth of the angle member to accommodate horizontal strands of fence wire, a vertical locking rod positioned between the outer surface of the post and the inner surface of the angle member and exteriorly of and engaging the portions of the horizontal fence strands which enter said slots to removably secure the fencing to the posts, said slots readily accommodating both the fence strand and the locking rod, and means for attaching said angle member to an ordinary fence post, the said member being readily attachable to a fence post of any size or shape.

DIGEST OF RECENT TRADE LITERATURE

Nema Handbook of Apparatus Standards. National Electrical Manufacturers Association, 420 Lexington Avenue, New York City. 346 pages.

A comprehensive reference book containing, as its foreword indicates, practical information concerning the manufacture, test and performance of electrical apparatus, including motor and generator, locomotives, electrical tools, industrial controls, transformers, switchgear and electrical measuring instruments. Symbols, rating standards, formulae and data tables are easily located by means of a thorough index. The work represents standard engineering and manufacturing practice in the United States and is designed to assist in harmonizing practices throughout the industry, to promote production economies, and to assist in the proper selection and application of electrical apparatus.

Some Causes of Failure in Wire Mining Ropes. Transactions of the Institute of Mining Engineers (England), March, 1928, P. 19.

A paper by Cecil H. Desch, F. R. S., Professor of Metallurgy in the University of Sheffield, discussing analyses of specimens of wire rope that failed in mining service because of torsion, sudden application of brakes, corrosion, faulty lubrication, etc. There are several illustrations from photographs, and the presentation of the paper was followed by questions and discussions which are reported. Among other suggestions, Professor Desch makes the point that tests commonly applied to wire rope in the smaller sizes are unsatisfactory for determining the serviceability of heavy duty grades.

British Market for Electrical Machinery and Equipment. Trade Information Bulletin No. 558, U. S. Bureau of Foreign and Domestic Commerce. 38 Pages.

A compilation by the electrical equipment division of the Bureau of facts of particular present interest to American exporters because of the prospect of cheaper current and its more widespread use in the British Isles. The text covers the status of British electrical and associated industries, power resources and generation, trade associations, local customs, taxes, marketing and selling methods, governmental restrictions, statistics and publications.

Central American Markets for Electrical Equipment. Trade Information Bulletin No. 563, U. S. Bureau of Foreign and Domestic Commerce. 23 Pages.

Although the present demand for power in these countries is very small, the rising standard of living is increasing the use of electric light and electrically operated appliances. The use of electricity is now limited almost entirely to household purposes in the cities. Manufacturing is limited mainly to foodstuffs and clothing and is not extensively electrified. This bulletin briefly covers present power and lighting facilities, domestic and industrial electrification, street railways, native customs and business methods in Guatemala, Honduras, Salvador, Nicaragua, Costa Rica and Panama.

Shippers Guide in Declaring Machinery For Export. Industrial Machinery Division, U. S. Bureau of Foreign and Domestic Commerce. 12 Pages.

A glossary of terms designed to help shippers make more accurate declarations of their products for export in order to improve the dependability of the Bureau's export statistics. Contains suggestions to exporters, a facsimile of a shipper's export declaration properly prepared, and classifications of industrial machinery arranged by groups and alphabetically.

Trade Literature Received

Aircraft Wire

"Aircraft Wire and Cable". Macwhyte Company, Kenosha, Wisconsin. 50-page booklet describing and illustrating high strength wires, cables, cords and tie rods for aircraft. Owing to the divergence of expression among the trade, there is included a definition of terms used in this specialized field.

Wire Rope Slings

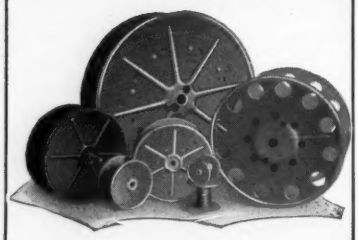
"Wire Rope Slings". John A. Roebling's Sons Company, Trenton, New Jersey. 88-page illustrated catalogue of wire rope slings for handling heavy loads in shop and field. Photographs show slings in use for a great variety of purposes and detailed drawings of set-ups are accompanied by data for determining sizes and dimensions for given loads.

Factory Lighting

"Work Light for Industrial Lighting". Cooper Hewitt Electric Company, Hoboken, N. J. 16-page catalogue of mercury vapor illuminating equipment for industrial plants. Illustrated with photographs of installations. Explains advantages of this type of lighting as compared with incandescent filament lamps for manufacturing areas and contains useful data for architects and illuminating engineers.

Metallography

"Microscopes in Metallurgy". Bausch & Lomb Optical Company, Rochester, New York. 16-page illustrated booklet describing and illustrating special equipment of the kind for shop and laboratory use. Includes minocular and binocular instruments, a recording camera for photomicrographs, and a special instrument for measuring impressions made in the Brinell Ball Test.



Light and Durable

Pressed Steel Reels

APCO - MOSSBERG Pressed Steel Reels for annealing and stranding are recognized throughout the wire industry as real money savers.

Modernize your equipment by using these light and durable reels made by a company thoroughly versed in pressed steel work.

Apco Mossberg Corporation

13 Lamb St., Attleboro, Mass.

Specialists in Developing Steel Reels for Annealing, Vulcanizing and Stranding; Also Bobbins for Wire Handling.

EDITORIAL BY-PRODUCTS

A New Use For Wire?

RECENT developments, not to say achievements, in weaving wire cloth for special purposes, prompts the supposition that some enterprising wire fabricator may yet weave a fire-proof fabric badly needed in coal mines. Brattice cloth, the textile material now generally used, is chiefly made of jute and cotton duck chemically treated as a protection against fire and rotting. The brattice cloth is used to deflect portions of the mine ventilating current into or toward the face of a working place and is extensively employed, particularly in gassy mines. Mine operators are interested in procuring at reasonable cost a brattice cloth with lasting fire-proofing quality and of as great durability and strength as possible. At present the greatest demand is for jute, and if a substitute is to be made it must be based on ultimate value as determined by consideration of the initial cost and wearing qualities.

The use of brattice cloth is most important in coal mine ventilation as it affords a means of circulating air to the workings in sufficient volume to keep them clear of dangerous quantities of explosives and harmful gases and to supply workmen with enough fresh air to protect their health. Dissatisfaction with the present material arises from its short life and susceptibility to fire and dampness. Brattice cloth, particularly when used for mine roadway curtains, is often subjected to severe usage, to moist air, and to mine water, which is frequently acid. Brattice cloth not properly fire-proofed may form a dangerous fire hazard, and the chemicals used for treating the textile composition are usually more or less soluble and are gradually leached out in damp or wet places. A questionnaire on the subject of Brattice Cloth, sent out by the Bureau of Mines, has supplied a fund or detailed information which is available to interested inquirers.

New Wire Fence Specifications

SIMPLIFIED Practice Recommendation No. 9, "Woven Wire Fencing," which was recently revised by the industry, is now in effect, as of July 1, 1928, subject to annual revision, according to the Bureau of Standards.

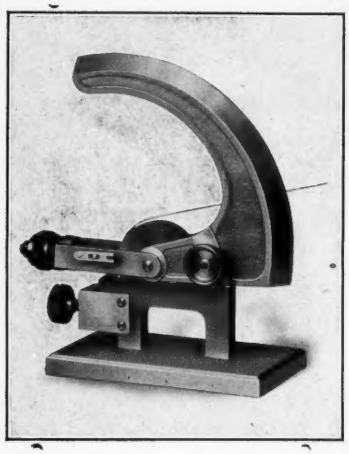
Recently, this project was submitted to the industry for signed acceptances, in view of the proposed revisions. The bureau has received a sufficient number of signed acceptances from producers, distributors, and users, representing at least 80 per cent by volume of annual production, to publish the revised recommendation.

It will be recalled that objections on the part of some fence manufacturers was reported in the July issue of Wire & Wire products.

The original recommendation, as adopted by the industry, reduced the variety of woven wire fencing from 552 to 69 and woven wire fence packages from 2,072 to 138. The revised recommendation further reduced this to 62 and 117, respectively. At the time the project was reviewed by the standing committee and revised it was stated that the average degree of adherence accorded this recommendation in 1927, based on an actual survey, was 99 per cent.

MORE than 140,000 miles of copper wire make it possible for the Pennsylvania Railroad to get in touch instantly with any part of its system on the largest private telephone and telegraph system in the world, according to the road's employees' magazine.

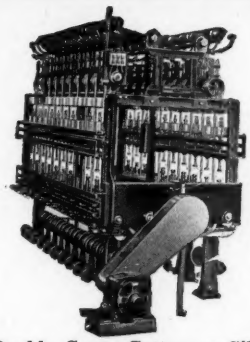
A Springless Tester for Magnet Wire



THE machine now made by the Morehouse Machine Co., of York, Pa., for testing the springiness of magnet wire operates on the principle of measuring the reaction or springiness by rolling the test specimen over a mandrel through a 900 degree arc and then measuring the reaction after pressure of the roller has been released. The amount of the reaction is indicated exactly by the graduations and is read in definite degrees from the scale. The specimens can be tested either with or without the fabric covering, as no appreciable difference has been noted by the removal of the insulation from any sample.

Midland Steel Changes

PRESIDENT E. J. Kulas of The Midland Steel Products Company has announced the appointment of Howard F. Kulas as Vice President with supervision of Sales. H. F. Kulas has been Secretary of The Midland Steel Products Company in charge of production and manufacturing of the Cleveland division since formation of the company in 1923. Throughout practically all of his business career he has been associated with E. J. Kulas, in the latter's various industrial enterprises. He has had extended manufacturing experience in metal stamping and metal drawing industries.



Double Cover Cotton or Silk
INSULATING MACHINE

EST. 1855 AIMco INC. 1915
"American" INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.
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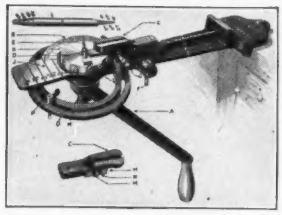
PHILADELPHIA PENNSYLVANIA U.S.A.
MAGNET WIRE
INSULATED WITH
COTTON—SILK—ENAMEL—PAPER
BREGUET HIGH-SPEED
WIRE DRAWING MACHINES

KILMER LITTLE GIANT WIRE FORMER

Forms Eleven Sizes of Eyes from Round, Square, Flat or Half-Round Stock, also almost any shape desired Quickly and Efficiently.
Adjustable for No. 3 to No. 24 Gage Wire.
The cut on the left shows a few of the thousands of the forms made on this
FORMER
Price $50.00



Patented April 2, 1918
Cleveland, Ohio, U. S. A.
Box 237, Station B.
M. D. Kilmer & Co.

"PREMIER"
Trade Mark of D. H. Co.

Diamond Dies

The perfected "Premier" Diamond Die will draw true to expectations any metal in any size suited to diamond die drawing—and do it with a marked decrease in interrupted production, repair work and replacement costs—that is why we say "Premier Diamond Dies save die expense." Satisfactory service is insured by a reputation backed by over twenty years of quality wire making.

Let us demonstrate their advantages for your particular requirements.

DRIVER-HARRIS COMPANY
HARRISON, NEW JERSEY
Chicago - Detroit - Morristown, N.J. - England - France
Alloy Makers since 1899

Are You Listed

in the

WIRE & Wire Products

Annual Directory, Index & Buyer's Guide?

1929 Edition Now in Preparation

Data is now being assembled for the second annual edition of the only reference work of its kind for bare and covered wire makers, fabricators of wire products, and sources of supply for wire and wire forming mill equipment.

Over eight hundred classifications, alphabetically arranged, cover everything used in the making and forming of all kinds of wire. The listings range from Abrasives to Zinc.

The book will be a convenient size for shop and office reference, printed in clear type on heavy paper and substantially bound in cloth. In every way it will represent an improvement over the current edition.

No Charge For Listings

To make this 1929 Directory as complete as possible, names of manufacturers and their products are being assembled now for careful revision before publication three months hence. Your name will be listed without charge or obligation under the headings you indicate.

Rates for advertising space in units of from one inch to full pages will be supplied on request. Very moderate rates are also available for Bold Face display listings in heavy type that makes the listing inescapably prominent when consulted by the reader.

You are urged to fill out this form **now** to avoid the possibility of having your name omitted from the contents of the Directory.

LISTINGS

(Specify Kinds of Wire, Wire Products, or Wire Mill Equipment)

.....

.....

.....

.....

.....

.....

Wire & Wire Products,
551 Fifth Avenue, New York City.

You may list our name, without charge, in the forthcoming issue of Wire & Wire Products Directory, Index and Buyer's Guide under the headings here indicated and send us particulars about advertising rates and rates for Bold Face display listings.

Name .....

Address .....

City ..... *State* .....

Electric Storage Battery Aids In Handling Heavy Cable

(*Continued from page 303*)

Five years ago, the 60-acre plot on which this plant is built was simply a section of the Jersey Meadows extending along the Passaic River. Now nineteen of the fifty-five projected buildings are finished covering The Storage Battery a floor area of 1,300,000 square feet. Thousands of cubic feet of fill have been made, railroad tracks have been laid connecting the great plant with the "mainland", and a waterfront has been constructed. Special transportation problems were encountered, both in the construction and in the operation of such a large plant in an isolated location, and new designs of trucks, cranes, and locomotives had to be worked out to give the best operating results.

Locomotive Cuts Costs

The first material handling equipment considered was a locomotive for switching and spotting incoming railroad cars loaded with building materials and manufacturing equipment. After a thorough investigation of various types of locomotives, such as steam, oil and gas-electric, third rail, storage battery, and combination of the latter two, electric storage battery locomotives were selected on account of their cleanliness, reliability, greater draw-bar pull, and general efficiency. One great advantage was that no roundhouse and no ash and coal handling equipment were required. A 60-ton locomotive equipped with an 18-ampere battery was purchased and was placed in service in July, 1925.

The locomotive is used from eight to ten hours a day, the battery being charged at noon and at night. Considerable heat is generated in the process of charging but sufficient ventilation has been provided in the battery compartments to remove this charging heat.

(*Continued on page 314*)

Oakite cleaning implifies pickling

DIPPING wire into an Oakite cleaning solution before pickling, removes every bit of oil, grease and dirt from each coil. You will be agreeably surprised to notice how much time is saved—how much easier it is to clean the wire, thoroughly and economically, the Oakite way.

One of our Service Men will gladly explain Oakite savings—the advantages of Oakite materials for cleaning, in anti-rusting or as a drawing compound. Write and he will call.

Oakite Service Men, cleaning specialists, are located in all the leading industrial centers of the United States and Canada

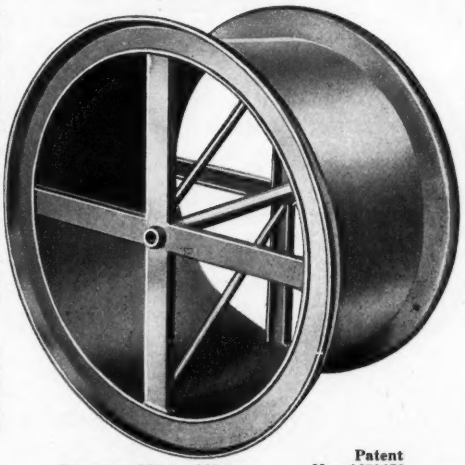
Manufactured only by
OAKITE PRODUCTS, INC., 52A Thames St., NEW YORK, N. Y.

OAKITE
TRADE MARK REG. U.S. PAT. OFF.
Industrial Cleaning Materials and Methods

A Pressed Steel Reel for Vulcanizing

ONE of the many Mossberg designs developed especially for the wire manufacturer. The constructional details of this reel place it in a class by itself. While it may be used for other purposes, the free opening through the center makes it particularly desirable for vulcanizing. Extremely strong and rigid, with weight at the minimum.

Arc welding makes each reel practically one continuous piece of steel, with no bolts or rivets to loosen and cause trouble.



Diameter 36" to 84"

Patent No. 1630670

MOSSBERG PRESSED STEEL CORPORATION

Attleboro, Massachusetts, U. S. A.

140 So. Dearborn St., Chicago — 33 Norwood Place, Greenville, S. C.

Modern Equipment
for
WIRE DRAWING
WIRE INSULATING
WIRE STRANDING
Cabling and Laying up Machines
Complete Equipment for the manufacturing of Conductor Cable and Wire Rope
WIRE MACHINERY CORP. OF AMERICA, INC.
FORMERLY
New England Wire Machinery Co.
Designers & Engineers
NEW HAVEN, CONN.

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The Waterbury Wire Die Co.
Diamond and Chilled
IRON DIES
DIAMOND TOOLS
Waterbury, Conn.

(*Continued from page 313*)

It is estimated that this locomotive is making a saving of $10 to $15 a day over the cost of operation of a steam locomotive, due to the elimination of the fireman, shop, coaling, ash handling, and hostler service, and the smaller investment required.

Another piece of battery powered equipment which has proven extremely reliable and efficient is a locomotive crane usd for handling reels of lead-covered cable in the storage yard and for loading them into cars, lighters, and steamers. The crane was originally designed to handle a 10,000-pound load at a 50-foot radius, but additional ballast has since been added to enable the unit to handle 12,000 and 15,000-pound reels of cable. The motor for hoisting as well as the one for moving the locomotive on the standard gauge track for which it is built are motivated by power from the 100-cell battery.

With a hoisting speed of sixty feet a minute and a travel speed of seven miles an hour, the crane handles from one hundred fifty to two hundred reels of cable daily, working from eight to ten hours, during which time it starts and stops from three hundred to four hundred times and travels a distance of fifteen to twenty-five miles.

This machine, powered by the electric storage battery, is admirably adapted to the special conditions which it is required to meet, and its performance is considered very satisfactory by the Western Electric engineers.

Use Battery Trucks

Several electric industrial trucks, many of them of special design, are used in and about the plant to handle the great bulk of heavy materials that go into the manufacture of cable. One is a 5-ton, 6-wheel lift truck equipped with 6-inch face wheels to facilitate the handling of heavy loads on cinder fills and runways. Another is an industrial crane truck used for handling barrels, large reel parts, machinery, and other equipment weighing up to 3500 pounds. Another is designed for reeling short lengths of stock lead-covered cable on reels for shipment. Both the rotating rolls and the travel of this truck are driven from the storage battery.

No other machine has done so much to ease heavy loads from the shoulders of workmen, and to render speedier as well as incomparably easier the handling of heavy materials, as has the electric storage battery incorporated in an industrial truck. This is impressively shown in the handling of copper bars and stacks of pig lead in the Western Electric plant. Formerly each bar and pig had to be lifted by hand and loaded on a hand truck, then unloaded in the same manner. An electric lift truck was designed, having two forks or "fingers" which run partially under and beside the stack of metal, raise the whole stack at once, and speed away to its destination.

Another lift truck "spears" a reel of wire as one would thrust a fork through the hole of a doughnut, raises it from the floor, and is on its way.

So simple to operate is the electric industrial truck, and so adaptable to different uses, that whenever a new load-carrying problem is encountered in the plant, a type of truck is found, or designed and built to order, which will meet the necessity.

To Standardize Belting

Because leather belting valued at about $30,000,000 is being purchased each year without accurate knowledge of its suitability for specific conditions of use, wearing qualities in service, or proper methods of maintenance, the American Society of Mechanical Engineers has asked the American Engineering Standards Committee to authorize the establishment of definite standards for leather belting as a guide to industrial purchasers. It is pointed out that such standardization, and the broader use of the test data underlying it, would lead to a great increase in the present knowledge of the properties of leather belting.

Wire Nails in The Making

(*Continued from page 299*)

and points each nail automatically.

The end of the wire is pushed through the feed into the jaws of the die, projecting about ¼ inches or so, according to the size of head of the nail required. Half a turn of the machine secures the wire in place. The machine then commences its sequence of operations, by forming the head on the nail, and it is for this reason that the extra projection is left. A reciprocating hammer shoots forward and flattens this projection into the form of the nail head, once in every cycle. As the hammer recedes the feed pushes the nail through to the full length of its stroke. The instant the end of the stroke is reached the nail is sheared by the pointing die and dropped into the receptacle beneath.

Factors in Production

The rate of production largely depends upon the size of nail required or the type of the machine used. For 2-inch nails a production speed of 400 per minute can be obtained, while for 3-inch nails the rate of production is only 300 per minute. Larger nails require correspondingly slower speeds. A No. 20 gage nail of normal lengths can be produced at 500 per minute.

The machines are grouped in batteries of 24 machines each, driven by a 50 h. p. motor and overhead drive. This grouping is done with a view to economy in meeting the varied demands for the large range of types and sizes of nails at present in use for domestic and industrial purposes. The arrangement requires a minimum of labor and attention, requiring only two men in attendance on every twelve machines. When running at full capacity this plant is capable of producing upward of fifty tons of nails and drawn wire per day.

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Riveting Machines	Draw Benches
Wire Pointers	Bull Blocks
Wire Rolling Mills	4 Slide Wire Machines
Headers of all kinds	Wire Cutters & Straightners
Bolt & Nut Machines	Staple Making Machines
Tapping Machines	
Cotter Pin Machines	

Roll Thread Machines

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(For hexagon and triangular netting) made from a Special Steel of about 70—80 kg solidity, and

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VIANNEY

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The oldest and largest Diamond Die plant in the world.
DIES of every weight for every purpose

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(*Continued from page 315*)

As the nails pass from the machine many have wings of metal adhering, and keen inspection is necessary to prevent a single nail being shipped in this condition. To clean the nails from oil and at the same time rid them of adhering "wings", they are put in rotary tumblers of octagonal shape with sawdust for a considerable time, after which the sawdust is drawn off by means of suction and carried to the roof where it is discharged into a tank. The chips or wings fall through the perforations of a separating tumbler, leaving only the clean commercial nail.

To Combat Corrosion

Depending upon the purpose for which the nails are intended they are subjected to various kinds of treatment. Roofing nails, for instance, which are always under the corrosive influences of the weather, require to be galvanized. The well known blue nail, too, has its purpose, which is a hygienic one. In trades using nails where craftsmen are addicted to holding the nails in their mouths, the blue ful. The blueing is effected in a rotary tumbler under heat at a tary tumbler under heat at a temperature of 600 to 800 degrees Fahr. Coated nails are also very popular for certain purposes, it being recognized generally that such nails have increased holding power. Tests in certain cases show this to be in the neighborhood of 190 per cent.

When the nails have received their final treatment they are packed in standard kegs, each weighing 100 lbs. In order to conserve space in packing nails into kegs they are packed mechanically. A filler consisting of several lateral divisions is inserted into a keg placed on a mechanical shaker. As the nails fall into the divisions they are constrained to form themselves into rows vertically in which they can most economically fill the space.

Bullet-Proof Wire Cloth Now Protects Banks

(*Continued from page 302*)

a piece of the wire which has stopped 45 calibre steel jacketed bullets from a Colt Automatic Revolver at a range of about 18 feet,—at which point this gun attains its highest velocity and power.

The bullet-proof wire is used principally over the bank cages, being placed in panels directly from the top of the screen to the ceiling, or lying flat on top of the cages with a grille work to the ceiling. In either way it prevents the bandit from shooting over the tops of the cages and if he does shoot the bullet cannot reach its objective. The wire is also used to cover side and back windows, skylights, areaways, etc. Experience with bandits in various cities has demonstrated that it is necessary to cover every possible point of exposure.

Research Helps New England Industries

(*Continued from page 297*)

Watch chains have always been considered more or less staple articles which every jeweler carried, but which he did not display prominently in his shop. Nothing new had come out in watch chains in a great many years. Therefore, there were no new selling points for the jeweler to talk about, except new designs which, after all, were something that he was expected to have on hand anyway.

During the last three or four years there has been a great demand among women for slave bracelets. Beginning as a fad, this style in jewelry has now became an accepted type of merchandise among women. The R. F. Simmons Company, Attleboro, Mass., in looking about for some new ideas to increase its business, considered the possibility of adapting the women's slave bracelet to men's watch chains. After some experimental research, it was found that the idea was entirely feas-

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"American" Pressed Steel Reels and Spools are designed and shaped to impart maximum strength for their weight. They also embody special patented features that contribute to their rigidity and capacity for hard service.

Above is shown a 24" x 16" x 6" "American" Reel with beaded flange for shop use and shipping. Standard models range from small spools with 2½" diameter to giant reels 8' in diameter, and include Stranding, Vulcanizing, Impregnating, Braiding, Annealing, Shipping and Shop Reels and Spools and Beams for a great variety of industrial purposes.

Write for descriptive catalog explaining advantages of the "American" design and construction principles.

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AMERICAN PRESSED STEEL REELS

ible from a production standpoint and this new chain took form. The distinctive feature of this new type of chain is the broad heavy link. Some of these links, in some of the designs, are more than an inch long. They come in a wide variety of designs, and combinations of green, white and yellow gold.

A name for this new product was chosen to represent style, and one of the principal sources of all men's styles being London, it seemed appropriate to call this new chain the "Bondstreet." The reaction of the trade to this new article of merchandise was favorable in most instances. While there were some remarks that this new chain was similar to the type worn by grandfather seventy-five years ago, nevertheless it was the general opinion that here was a new style in men's watch chains which should enable jewelers to do additional business in this type of jewelry.

In the past most men have been accustomed to wearing one type of watch chain for every occasion. This chain is not particularly suitable for formal or semi-formal evening wear, but it is ideal for business or sports wear and a study of the situation convinced the company that many men are now thinking of watch chains in terms of at least two different types of chains and sometimes three, the third type being the belt chain which is popular during the summer months when vests are not worn. This chain slips over the belt and secures the pocket watch firmly.

From a manufacturing standpoint, the new "Bondstreet" chain reduced labor costs—due to the simplicity of its design. The amount of precious metal was correspondingly greater, but the saving in labor more than made up for this addition. Hence, this new chain not only created a new style, giving an added impetus to sales, but it also helped to reduce production costs.

Wire Testing By Mechanically Operated Machinery

(*Continued from page 296*)

stress are given by a revolution counter and the machine is automatically stopped when fracture occurs. The uses of this type of machine are limited to equal tension and compression.

Machines of type number (2) —there are only three.

1. In which the load is applied through Cams.
2. In which the load is applied hydraulically.
3. In which the load is applied electrically.

Fig. F shows diagrammatically a machine in which the load is applied electrically and is designed by Dr. Haigh of the Royal Naval College, Greenwich, and manufactured by Messrs. Bruntons, Musselburgh. This machine is capable of testing metals under direct tension and compression, alternating between equal or unequal loads and in pulsating tension or compression.

Action of Electric Machine

The action of the machine depends upon a pair of electro magnates, M. 1. & M. 2., supplied with two-phase currents from a small alternator. The forces generated by these magnates, pulling on opposite sides of a single armature A, are transmitted to the lower end of the test piece T; the upper end of which is gripped in a holder that forms part of the adjustable head H. The magnets and adjustable head are rigidly connected by four vertical columns that form part of the main frame of the machine.

All stresses being self-contained within this frame, no considerable vibration is transmitted to the foundation. The vibrating armature and connecting rods being guided by springs without the use of lubricated slides or bearings, the machine is almost silent in its operation.

The frequency of reversal of stress is governed by the speed

of the alternator and is usually 2000 stress cycles per minute—corresponding to a 1000 RPM. Each cycle of stress includes one pull and one push.

Although the majority of tests are performed with stresses ranging between equal intensities of pull and push, the ratio between the extremes may be varied at will. The adjustment is effected by giving the flat springs S a suitable degree of initial load, as indicated on the scale I.

Springs and Alternator

The springs S serve the further purpose of compensating the force required to accelerate the armature and its fittings in their small but rapid vertical movement. The spring stiffness may be adjusted to suit widely different frequencies of operation by increasing or decreasing the distance between the two inner clamps, according as the frequency is lower or higher.

The alternator, which is capable of an output of 10 amps at 120 volts, is driven by a one-horse D. C. Electric Motor. The frequency of this alternator is 16 2/3 cycles per second which equals 1000 cycles per minute. One phase of the current is led to the magnet M. 1. and the other to M. 2. As one phase is stepped 180° behind the other it ensures that one magnet is attracting the armature with increasing force when the other magnet is repelling the armature with decreasing force. The voltage of these two separate phases are simultaneously controlled by varying the voltage of the excitation current of the generator.

Magnetic Induction

The total magnetic flux induced in these magnets is measured by means of two secondary coils placed round the pole faces. The current induced in these two coils is led to a stress meter which is in reality a very sensitive type of volt meter, although it does not actually read volts. A calibration chart is provided which converts stress meter readings into total load on the specimen.

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Domestic Exports of Iron and Steel Wire, Wire Rope and Nails, From the United States, By Countries
June, 1928

Countries	Plain iron or steel wire	Galvanized wire	Barbed wire	Wire rope	Insulated iron or steel wire and cable	Wire nails
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Belgium	2,265	.....	.....	1,806	.....	.....
Bulgaria	.....	2,414	.....	.....	.....	.....
Germany	.....	44,824	.....	4,192	.....	.....
Greece	.....	13,548	.....	.....	.....	.....
Italy	11,682	.....	.....	.....	.....	.....
Norway	3,500	.....	.....	.....	.....	.....
Poland & Danzig	6,011	.....	.....	.....	.....	.....
Rumania	.....	.....	.....	6,210	.....	.....
Soviet Russia in Europe	.....	.....	.....	38,426	.....	.....
Sweden	100	.....	.....	.....	.....	.....
United King.	217,597	27,495	.....	3,930	.....	48,150
Canada	1,022,419	1,838,792	1,695,342	143,856	2,454	4,258
B. Honduras	.....	.....	16,343	419	.....	300
Costa Rica	4,760	3,057	33,400	4,619	.....	11,160
Guatemala	5,680	.....	160,240	4,221	3,383	56,597
Honduras	102	.....	259,750	12,585	1,270	44,500
Nicaragua	500	489	201,320	8,592	90	24,600
Panama	11,975	10,400	98,200	34,472	.....	25,080
Salvador	5,600	.....	236,268	240	.....	102,824
Mexico	397,935	234,225	1,103,214	122,718	62,045	31,116
Miquelon & St. Pierre Is.	.....	.....	.....	.....	.....	2,000
Newfoundland & Labrador	113,249	11,211	.....	712	.....	1,000
Bermudas	.....	.....	.....	500	.....	900
Jamaica	250	.....	108,252	1,890	.....	41,002
Trinidad & Tobago	.....	.....	.....	4,738	.....	.....
Other B. W. Indies	2,000	.....	10,100	837	183	13,000
Cuba	138,771	101,699	1,480,580	55,146	.....	139,717
Dom. Rep.	101	22,615	426,585	14,796	.....	51,050
Netherland W. Indies	37	9,717	.....	198	.....	.....
Haiti, Rep. of	500	.....	15,660	805	.....	18,675
Virgin Islands of U. S.	150	118	4,542	.....	.....	1,800
Argentina	2,093,189	1,563,676	4,436,636	67,852	1,040	.....
Bolivia	.....	.....	1,000	8,548	.....	400
Brazil	129,455	173,015	1,223,685	14,619	1,640	1,240
Chile	4,111	105,012	100,091	11,767	.....	218
Colombia	15,600	20,126	1,245,287	11,490	5,524	275,330
Ecuador	459	.....	50,000	957	1,777	83
B. Guiana	.....	.....	.....	.....	.....	600
Paraguay	.....	.....	5,000	89	.....	2,205
Peru	3,880	18,590	49,750	55,688	2,120	90,693
Uruguay	126,216	85,759	160,847	1,960	.....	.....
Venezuela	1,032	3,998	128,016	84,299	.....	49,125
B. India	1,014	.....	.....	11,105	.....	270
B. Malaya	1,737	.....	41,734	11,677	.....	.....
China	212	163,385	118,165	.....	.....	1,387,379
Other Netherland E. Indies	.....	.....	45,000	55,610	.....	.....
Hong Kong	.....	400	.....	.....	.....	.....
Japan	172,405	770,600	67,200	7,968	.....	.....
Palestine	215	.....	.....	.....	.....	.....
Philippine Islands	204,215	9,304	412,760	149,786	.....	409,621
Soviet Russia in Asia	.....	1,000	.....	611	337	67,814
Turkey	.....	4,486	.....	.....	.....	.....
Australia	64,827	24,959	38,760	110	.....	1,283
B. Oceania	.....	.....	.....	.....	.....	4,900
F. Oceania	.....	1,300	5,000	.....	58	1,825
N. Zealand	755	59,360	18,400	655	.....	2,065
B. E. Africa	.....	.....	.....	910	.....	.....
Union of South Africa	1,359	344,900	616,040	820	.....	121
B. W. Africa	.....	.....	218	.....	.....	.....
Liberia	.....	282	324	.....	.....	.....
Morocco	.....	.....	141,400	.....	.....	.....
Total Quantities	4,765,856	5,670,756	14,755,109	962,424	81,321	2,912,901
Total Value	167,604	141,467	416,808	144,737	6,383	84,947

Shipments from the United States to Non-Contiguous Territories.

Alaska	53,281	146,231	13,554	14,479	620	211,720
Hawaii	8,202	28,756	128,940	1,480	2,774	37,425
Porto Rico	8,202	28,756	128,940	1,480	2,774	37,425

June Wire Exports

THE Bureau of Foreign and Domestic Commerce figures for June, reported herewith, show a falling off in all classifications for that month in comparison with May except in Galvanized Wire, Barbed Wire, and Wire Rope. Export tonnage of all these items was approximately the same as for the previous month.

Our three largest foreign customers for bare wire—Canada, Mexico and Argentina—took well over three quarters of the total quantities shipped and nearly that proportion of the Galvanized tonnage. Argentina's imports of Galvanized from us was about double that

Domestic Exports of Iron and Steel, Wire Manufactures, Horseshoe Nails and Horseshoes From the United States, By Countries June, 1928

Countries	Woven wire fencing	Woven wire Screen Cloth		Wire n. e. s. & manufactures of	Horseshoe nails	Horseshoes
	Pounds	Pounds	Dollars	Pounds	Pounds	Pounds
Belgium	.....	.....	.....	1,160	.....	.....
Denmark	.....	.....	.....	2,556	.....	.....
Finland	.....	.....	.....	112	.....	.....
France	.....	.....	.....	9,742	.....	.....
Germany	.....	.....	.....	1,471	8,194	.....
Irish F. State	.....	.....	.....	648	.....	.....
Italy	.....	.....	.....	550	.....	.....
Netherlands	6,270	49	22	1,919	2,420	.....
Norway	18,240	.....	.....	3,423	.....	.....
Poland & Danzig	.....	.....	.....	3,301	.....	.....
Portugal	.....	.....	.....	25	.....	.....
Soviet Russia in Europe	.....	.....	.....	1,737	.....	.....
Sweden	.....	.....	.....	3,107	.....	.....
United King.	63,416	2,025	606	145,110	.....	.....
Canada	114,523	236,888	14,050	583,624	125	34,475
B. Honduras	989	.....	.....	1,483	.....	.....
Costa Rica	168	1,060	129	415	400	8,000
Guatemala	70,553	296	63	1,452	.....	.....
Honduras	814	3,262	584	2,041	.....	400
Nicaragua	128	166	74	1,236	100	.....
Panama	205	7,202	886	5,437	.....	4,170
Salvador	2,651	.....	.....	6,600	.....	.....
Mexico	79,755	37,526	6,380	81,526	64,262	5,814
Miquelon & St. Pierre Is.	130	.....	.....	.....	.....	.....
Newfoundland & Labrador	4,488	1,979	309	7,016	.....	.....
Bermudas	893	1,778	241	1,833	.....	.....
Barbados	244	.....	.....	80	.....	.....
Jamaica	2,059	1,451	185	1,414	560	.....
Trinidad & Tobago	2,401	806	180	20,631	400	.....
Cuba	124,534	7,997	1,578	96,915	9,300	.....
Dom. Rep.	3,714	2,113	281	18,629	.....	1,000
Netherland W. Indies	14,136	414	394	2,603	500	.....
Haiti, Rep. of	699	61	11	2,404	.....	.....
Virgin Islands of U. S.	1,559	.....	.....	.....	.....	.....
Argentina	2,137	2,891	576	8,094	20,334	.....
Bolivia	.....	3,849	672	6,942	.....	.....
Brazil	5,760	10,972	1,826	113,896	.....	.....
Chile	.....	.....	.....	16,247	41,775	3,300
Colombia	8,998	7,223	1,064	16,539	57,900	.....
Ecuador	.....	.....	.....	7,465	5,100	.....
B. Guiana	.....	383	70	.....	.....	.....
Paraguay	6,000	.....	.....	.....	.....	.....
Peru	.....	1,837	368	11,213	3,500	.....
Uruguay	3,408	320	49	8,682	.....	.....
Venezuela	40,144	5,139	804	7,519	9,000	.....
B. India	172,070	1,655	309	6,380	1,240	.....
B. Malaya	756	.....	.....	287	.....	.....
China	227	3,238	908	52,225	1,050	.....
Java & Madura	.....	.....	.....	4,117	.....	.....
Iraq	.....	.....	.....	60,256	.....	.....
Japan	14,633	.....	.....	290,389	42,000	.....
Kwantung	.....	.....	.....	160	.....	.....
Philippine Islands	139,399	7,233	1,301	33,773	630	.....
Soviet Russia in Asia	.....	90	14	.....	.....	.....
Australia	4,595	15,278	2,869	71,594	9,870	.....
B. Oceania	.....	150	15	.....	.....	.....
F. Oceania	.....	.....	.....	30	.....	.....
N. Zealand	468	1,505	261	10,580	7,458	.....
B. E. Africa	7,974	.....	.....	.....	.....	.....
Union of South Africa	2,253	4,491	1,222	7,633	100	.....
B. W. Africa	624	.....	.....	.....	.....	.....
Mozambique	.....	6,805	1,268	300	.....	.....
Other B. W. Indies	2,621	858	180	20,631	400	.....
Total	924,636	.....	.....	1,760,207	286,218	57,159
	51,464	378,990	39,661	193,037	31,969	4,371
Shipments from U. S. to:						
Hawaii	157,233	24,458	3,438	60,628	1,332	1,107
Porto Rico	33,877	10,270	1,514	20,000	1,528	.....

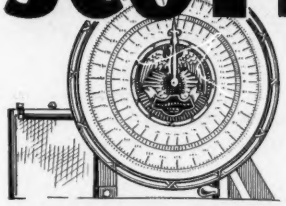
of May, which, in turn, had shown a big increase over April.

China continues to be our best customer for Wire Nails and there are no particularly notable figures reported for Wire Rope or Insulated Wire and Cable.

In the wire products divisions Cuba and British India come into relative prominence with twice their last month's volume of Woven Wire Fencing. In miscellaneous manufactured products of wire, the three big consumers, Canada, Mexico and South America, top the list, as usual, and after them the only countries whose purchases were at all noteworthy are China, the United Kingdom, Japan, Java and Madura, and Australia.

In making any use of the above figures it should be remembered that they are taken from the first available report and are subject to revision.

SCOTT



HORIZONTAL & VERTICAL TESTING MACHINES FOR WIRE

Give visible reading and graphic charts showing strength, stretch, elongation and action under stress. Used to establish standards governing purchasing and manufacturing.

HENRY L. SCOTT Co.
PROVIDENCE, R.I.

TESTERS

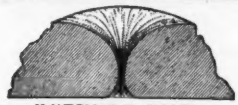
WIRE DRAWING DIAMOND DIES

Over 30 years experience in this line. The best equipped establishment in America with modern methods and machinery.

New way for re-inforcing the diamond.

(U. S. Patent 1,624,027. April 12, 1927.)
Tel. Webster 5105, Cable Address: Krauseco

F. KRAUSE & CO., Inc.
250-252-Ogden Ave.
JERSEY CITY, N. J.



WATCH THE SHAPE
COCHAUD
Wire Die Corporation

Wire Drawing Diamond Dies
300 West 56th St., New York
Tel. Columbus 10148

BUYERS' GUIDE

For more complete information, consult the annual Directory, Index & Buyers' Guide.

BAKERS

Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CLEANING COMPOUNDS

Oakite Products, Inc., N. Y.

CRANES

Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIES—Chilled Iron

The Waterbury Wire Die Co., Waterbury, Conn.

DIES—Diamond

Bellet & Bouvard, N. Y.
Cochaud Wire Die Co., New York.
Detroit Wire Die Co., Detroit, Mich.
Diamond Die Co. of America, N. Y. C.
Driver-Harris Co., Harrison, N. J.
F. Krause & Co., Inc., Jersey City, N. J.
Union Wire Die Corp., New York, N. Y.
Urdika Wire Die Co., N. Y. C.
Vianney Wire Die Works, New York.
The Waterbury Wire Die Co., Waterbury, Conn.

DIES—Repairs & Re-Cutting

Bellet & Bouvard, N. Y.
Cochaud Wire Die Corp., New York
Diamond Die Co. of America, N. Y. C.
F. Krause & Co., Inc., Jersey City, N. J.
Urdika Wire Die Co., N. Y. C.
Vianney Wire Die Wks., N. Y.

DRAWING COMPOUNDS

Oakite Products, Inc., N. Y.

FURNACES—Wire Annealing

Vaughn Machinery Co., Cuyahoga Falls, O.

GAUGES—Wire

A. Waldeck & Co., Cleveland, Ohio.

LATHES—Die Reaming

Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LUBRICANTS—Wire Drawing

Adam Cook's Sons, Inc., New York City.

MACHINERY—Armoring (Cable, Wire, Hose)

J. I. Bernitz, New York.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson.

MACHINERY—Balancing

Herman A. Holz, New York.
Riehle Bros.
Henry L. Scott Co., Providence, R. I.

MACHINERY—Bundling

J. I Bernitz, New York.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson.

MACHINERY—Cutting

J. I. Bernitz, New York.
The F. B. Shuster Co., New Haven, Conn.

WIRE WEAVING LOOMS

M. A. Irmischer, New York.

MACHINERY—Coiling

J. I. Bernitz, New York.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Chain Forming

J. I. Bernitz, New York.
M. A. Irmischer, New York.

MACHINERY—Electric Chain Welding

J. I. Bernitz, New York.
M. A. Irmischer, New York.

MACHINERY—Enameling

Coilton Electric Mfg. Co., Easton, Penn.

MACHINERY—Forming

J. I. Bernitz, New York.
M. A. Irmischer, New York.
Sleeper & Hartley, Inc., Worcester, Mass.
M. D. Kilmer & Co., Cleveland, Ohio.

MACHINERY—Gem Clip

J. I. Bernitz, New York.
M. A. Irmischer

MACHINERY—Insulating

American Insulating Machinery Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.

MACHINERY—Nail

J. I. Bernitz, New York.
M. A. Irmischer, New York.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Pointing

M. A. Irmischer, New York.
Morgan Construction Co., Worcester, Mass.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Pin & Needle

J. I. Bernitz, New York.
M. A. Irmischer, New York.

MACHINERY—Screw Wire

Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Second-hand

Jesse Atherton, Providence, R. I.

MACHINERY—Spring Making

J. I. Bernitz, New York.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple

J. I. Bernitz, New York.
Sleeper & Hartley, Inc., Worcester, Mass.
M. A. Irmischer, New York.

MACHINERY—Straightening

J. I. Bernitz, New York.
Sleeper & Hartley, Inc., Worcester, Mass.
M. A. Irmischer, New York.
F. B. Shuster Co., New Haven, Conn.

MACHINERY—Stranding

J. I. Bernitz, New York.
M. A. Irmischer, New York.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson.

MACHINERY—Spooling

American Insulating Machinery Co., Philadelphia, Pa.
M. A. Irmischer, New York.
Chas. Koegel Sons, Co.

MACHINERY—Panning

American Insulating Machinery Co., Philadelphia, Pa.

MACHINERY—Testing

Herman A. Holz, New York.
Riehle Bros., Phila., Pa.
Henry L. Scott Co., Providence, R. I.

MACHINERY—Winding

J. I. Bernitz, New York.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Drawing

American Insulating Machinery Co., Philadelphia, Pa.
Broden Const. Co., Cleveland, Ohio.
Burlingame Machine Co.
Kratos Wks., N. Y. C.
Morgan Construction Co., Worcester, Mass.
M. A. Irmischer, New York.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
The Vaughn Machinery Co., Cuyahoga Falls, Ohio.

NEUTRALIZING COMPOUNDS

Oakite Products, Inc., N. Y.

REELS—Annealing

American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
R. B. Hayward Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

PRESSES—Rivet & Bolt

M. A. Irmischer, New York.

SOAPS—Wire Drawing

R. H. Miller Co., Homer, N. Y.

SPOOLS—Wire & Cable

American Pulley Co., Philadelphia, Pa.
Apco-Mossberg Co., Attleboro, Mass.
R. B. Hayward Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TRUCKS

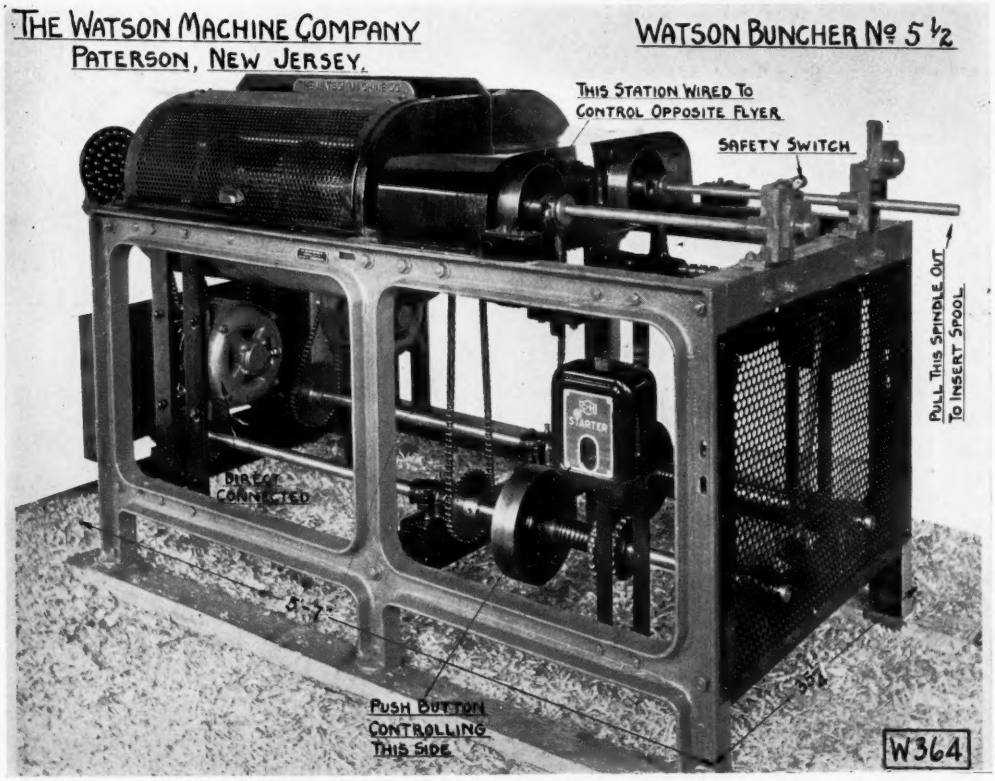
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.



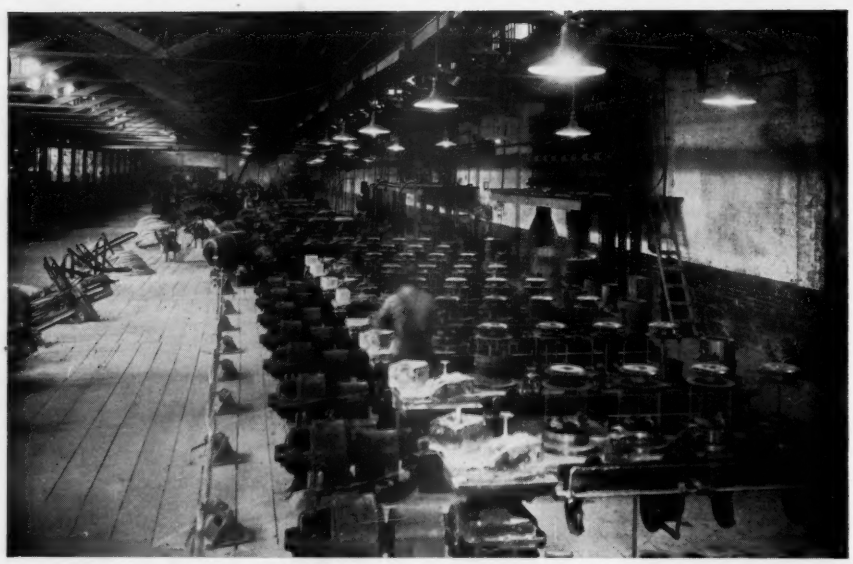
For Bunching "Lamp" and Other Soft Copper Fine Strands

The ease of control and adjustment of this machine result in maximum production in its field

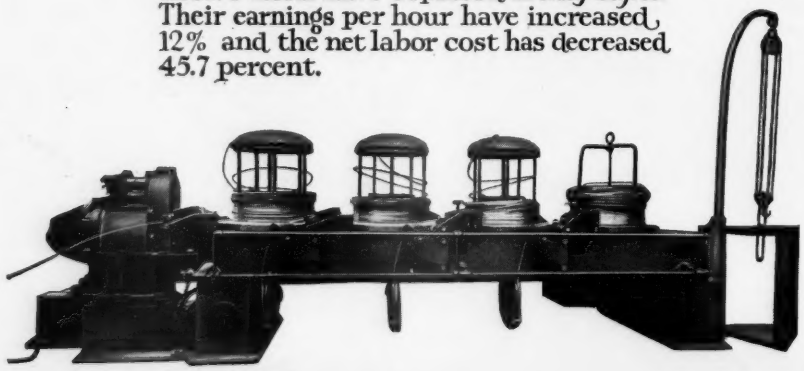
Receiving bobbin carries 70 pounds of copper

ELECTRICAL WIRE AND CABLE
WIRE ROPE and CORDAGE MACHINERY

MORGAN
WORCESTER
ENGINEERS AND MANUFACTURERS



Through this installation of
Morgan Connor Wire Machines
twelve men have replaced *twenty-eight.*
Their earnings per hour have increased 12% and the net labor cost has decreased 45.7 percent.



MORGAN CONSTRUCTION CO.
WORCESTER, MASSACHUSETTS, U.S.A.